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R. H. STINCHFIELD, *Editor*

Editorial Office: 1155 16th Street, N. W., Washington 6, D. C.

VOLUME XXXI NO. 6

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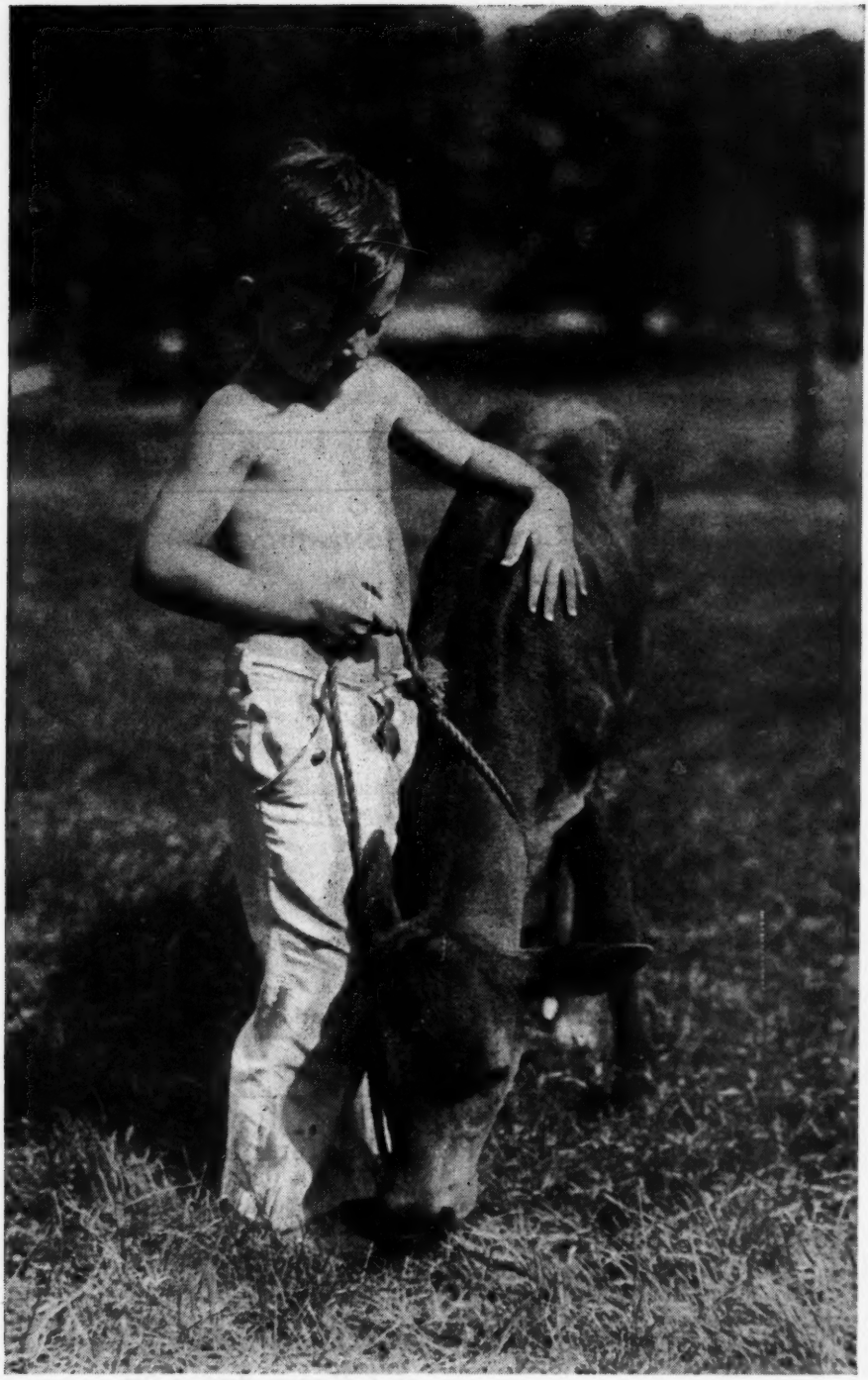

CONTROLLED PASTURING?

Better Crops with PLANT FOOD

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VOL. XXXI WASHINGTON, D. C., JUNE–JULY, 1947 No. 6

Memories of . . .

Motor Meanderings

Jeff McDermid

AFTER driving motor cars fully 400,000 miles in twenty years, I've not had my hands on a steering wheel for thirty months—and do not seem to miss it much. Last week I rode with a friend along a dizzy, busy highway on a main artery southward, and I got panicky thinking how I had been able to escape a crash landing in all those years I piloted a car under various hazards, such as weather, breakage, and my own or someone else's blundering.

My very first experience of responsibility on the open road was behind a gentle bay mare, and being young and only recently graduated from holding the extreme ends of the reins back of my father's hands, I was pretty skittish and jumpy. The driver's seat of the high, old buggy seemed to be at an enormous elevation above the lumbering equine power generator with which I was entrusted for guiding and commanding.

I looked down along her broad back to see if all the straps and buckles were snug, peered over at the tugs and scanned the singletree, and hoped the wheel bolts were tight. Whenever I saw a cloud of dust ahead I yanked the right-hand rein long before the approaching wagon met me, townward bound. In similar fashion I gave more than my entitled half of the gritty turnpike at the sound of some clattering vehicle coming up from the rear.

No hindsight mirror enabled me to detect the teams drawing abreast of me, and I was braced and tense lest some careening runaway outfit should catch up and smash us or snap off our running gear. Sitting upright and stiff like one of the tin-man drivers on my circus-wagon toy, I grasped the lines

until my knuckles were white and braced both feet against the dashboard. The mere sight of the frayed whip in its leather socket at my right made me tremble. I was in no mood for "acceleration," but I sure hoped the buggy brakes were working. It was at least two months before I relaxed like the mare herself and jogged forward through summer lanes enjoying the views on either side.

Runaways of those days were bad enough sometimes to instill all this fear and trepidation. Just previous to my initiation as a horse persuader, I had stood well back from the village curb and gasped in horror at a first-class runaway. The fear-crazed driver was an old man, standing with shaking legs and bulging eyes, sawing vainly at the bit of a fractious colt doing a speedy mile down the dusty street lined with nags and vehicles at the hitching racks.

At the narrow corner near the canal the colt missed the turn and smashed the light wagon against the stone wall, throwing the feeble farmer twenty feet in the air and cracking his skull on the wood-block pavement like an egg-shell. It was a wonder that this vision of sudden death did not condition me forever against driving anything.

HEAD-ON collisions were not as common in the old runaway age as they have since become with motor demons. Rear-enders and side swipes were more frequent, but the chances of any outfit being involved other than the one which the terrified horse was hauling were risky enough anyhow. Brakes didn't do much good either, because a scared animal would snake a stoneboat to perdition if it had to.

I presume there are no accurate available records assembled to inform us of the relative accident rates, comparing the horse-drawn era with modern gas-propelled travel. The number of vehicles on the highways was only a small fraction of those we have today, the "open road" was not so open, and the racing of those simple days was mostly pre-arranged, prepared for, and premeditated. Of course, the drunken driver had his awful innings back there too, and I have often helped pull scores of sodden wrecks from weedy ditches and recovered lost horses for them.

AFTER I left home to earn my own board and keep there came an interval of a few years when I remained afoot, having no conveyance to drive or any reason for driving one. During this period the horse entered the eclipse, and by slow degrees the livery stable and its back-yard counterparts underwent a slow demise. The socket-wrench and the starting crank replaced the harness and the hames.

Many of my old boyhood chums had yielded to the new mode of transportation and they talked wisely of Reo's Cartercars, Maxwells, Marmons, White Steamers, Locomobiles, and Fords; and chatted in a strange jargon about carburetors, manifolds, and grease-guns. But I resumed my plodding on a small stipend, shoe leather being my chief overhead for locomotion. A few of them gave me rides, while I held onto my hat and wondered if they could "ever stop her."

Within two years after I had found the right life partner, our mutual yen for open country rambles bloomed forth at last in the shape of a third-hand four-cylinder Ford hack, that model with the extra broad rear and the high top, a car which moved up, down, and sideways almost as consistently as it rumbled forward.

I tried it once around the block and was too scared to make another attempt, the foot work being too complex for my slow comprehension. The fact that the old car came to us direct from a good Methodist minister did not mend my morale. It still carried a sly hint of the devil in it, to my wary eyes. My courage waned.

So the job of chauffeur to the family rested with my young wife. She took me along for company and a possible

puncture. Her eyes were aglow with pride at the ownership of such a gorgeous buggy, and she meant to enjoy it whether or no. It took some courage on her part, considering the age of the relic we rode in, the scarcity of repair shops in those days, and the narrow, rutty roads. Moreover, she had never been a horsewoman and traveling the open road was new to her. I have never sneered since then at (1) women's driving or (2) husbands who let their wives pilot the family car invariably.

Presently my wife had her first baby. While she was in the hospital I resolved to sell the old ministerial marvel and secretly buy a brand new Chevrolet. Inasmuch as lying-in fees were not as inflated then as now and we had good local credit established, I was not conscience-smitten by the undertaking thus contemplated. Anyhow the miracle happened and I took a few lessons on the sly, being doubly determined not to be timorous in this, as long as she had been so brave in "that."

SO the bright morning came when the Doc had dated the new Mother to return to our nest with the new prize package. I carried the baby out, with a nurse trailing along beside my wife. At first sight of the shiny new car, my wife stopped in her tracks and asked whose auto I had borrowed, and what on earth had happened to "old invigorator."

The thrilling story was soon told, the joyful tears were on tap as expected, we bundled everything in, and away we all sailed on that very first of many pleasant family jaunts taken in that bus and four of its successors. On the next Sunday we took Grandma and Uncle Rupert and the new baby on a wonderful outing amid the fields of summertime, doing, as I recall with bated breath, at least 35 miles an hour where the gravel road was level. We called on a group of relations who owed us many a meal, and thereby received some immediate interest on our investment.

I used to get sentimental over Black Beauty, and later about some of our numerous nags, but I never imagined myself getting that way about an old senseless, mechanical contrivance like a greasy motor car. Yet I solemnly swear that on each occasion when I turned in a car in trade on a new one, and as I sorted out things of my own from its pockets and compartments, it made me feel regretful, just like losing an old friend. I have even patted the hood of such a vehicle that had carted me around unscathed for 60,000 miles, and muttered to it, "Goodbye and a good operator for you," as I handed over the keys.

For you know from similar experience that a driver and his automobile finally become somewhat synchronized and harmonious, a sort of mysterious connection existing between the man and the machine. Any slight defect or maladjustment in the mechanism is instantly translated to the driver's hands and feet; and by the same token, the weakness or inattention of the driver quickly affects the gears and gadgets of which he is almost a part. But it takes a few hundreds of miles of driving to fix that relationship firmly after a new car is bought.

Many of my business trips have been

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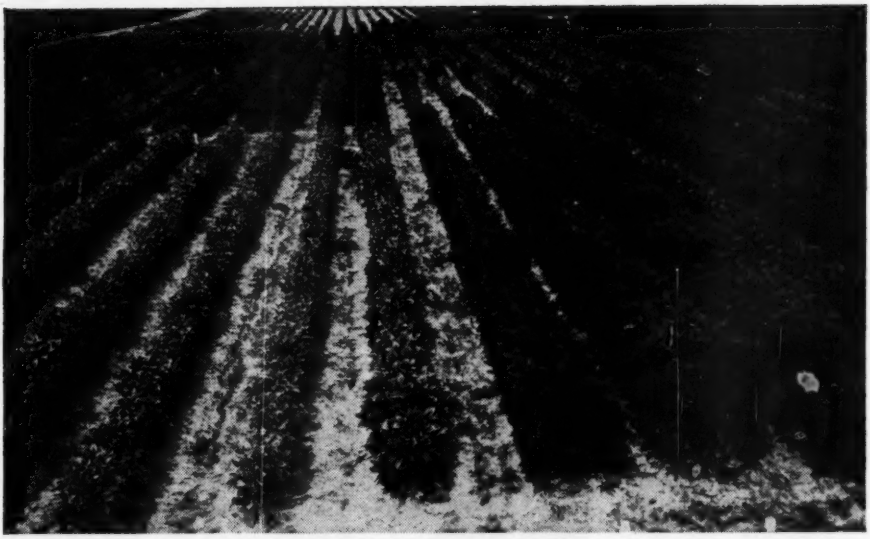

Fig. 1. A soybean experiment located on a Norfolk sandy loam low in available nutrients, particularly potash. The average State yield can be tripled with the use of a good liming and fertilization program along with good stands of adapted varieties.

Profitable Soybean Yields in North Carolina

By W. L. Nelson and E. E. Hartwig

Agricultural Experiment Station, Raleigh, North Carolina

SUCCESSFUL production of soybeans in the Southeast is largely dependent upon an adequate supply of plant nutrients and a good stand of an adapted variety (fig. 1).

The 1939-44 reported yield of soybeans in North Carolina was 10.9 bushels per acre. Yields such as these are not profitable. As a rule, little fertilizer or lime is used on soybeans or on the crops in rotation with soybeans. Soybeans, however, require potash and phosphorus just like cotton, tobacco, corn, or any other crop (fig. 2). While the amounts removed by soybeans vary with location, season, and variety, it should be noted that approximately twice as much K_2O as P_2O_5 is removed.

Experimental work conducted in North Carolina the past few years shows that yields of 30 to 40 bushels per acre can be regularly expected if proper production practices are followed. These important practices were found to be as follows:

(a) Liming the soil with dolomitic limestone in accordance with its requirements as shown by soil tests.

(b) Fertilizing with adequate amounts of potash and phosphorus.
(c) Planting and securing a good stand of an adapted variety.

Experiments

In order to show more clearly the importance of these practices in the successful production of soybeans, nine tests were located in the Coastal Plain of North Carolina in 1946.

Dolomitic limestone was broadcast in February on the lime plots with the normal rate being one ton per acre. Plots with no fertilizer and with 400 pounds per acre of 0-10-20 were located on the limed and unlimed blocks. The 400-pound rate was selected because a 40-bushel crop of beans will remove at least three-fourths of this amount. The 0-10-20 analysis was used because, as shown by figure 2, soybeans require twice as much potash as phosphorus, and other crop response data indicated that this would be a desirable ratio. In addition, potash alone and phosphorus alone were applied on the limed plots. The fertilizer was placed in bands to each side of the seed. The Ogden variety was planted at a rate sufficient to give 10 to 12 seeds per foot in a 3- or 3½-foot row.

Results

The results obtained in these experiments reveal the importance of lime and fertilizer very clearly (fig. 3). An average of all the tests showed the following yields: no lime or fertilizer, 22.0 bushels; lime alone, 24.8 bushels; fertilizer alone, 27.2 bushels; lime and fertilizer, 34.4 bushels (table 1 and fig. 3). These results show that the addition of lime alone or fertilizer alone is not sufficient. Attention must be directed toward both factors if maximum yields are to be reached. In addition, both phosphorus and potash were necessary in most of the experiments (table 1). As shown by the average yields, phosphorus alone increased yields 2.2

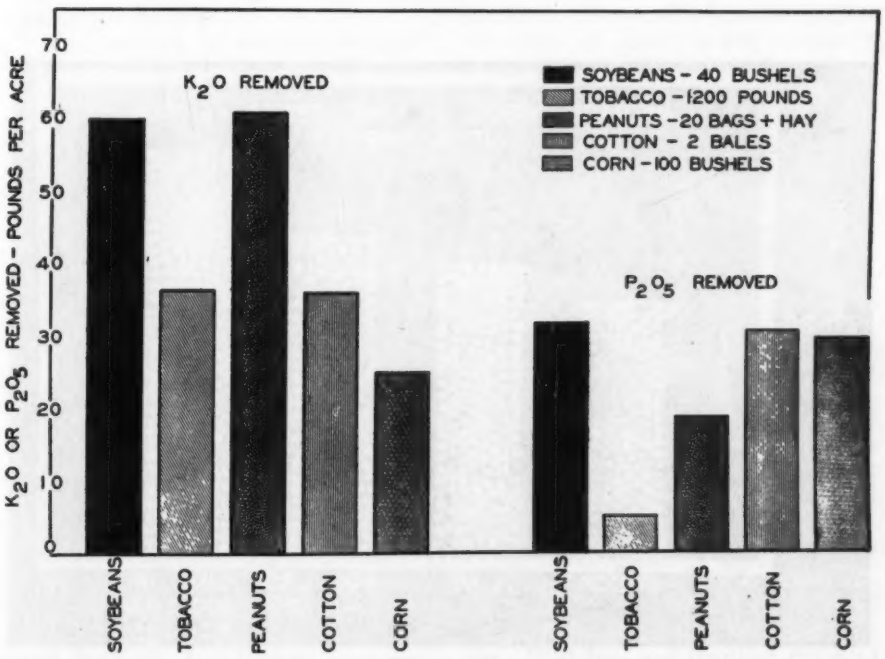

Fig. 2. Soybeans require phosphorus and potash just like other crops. (K_2O and P_2O_5 removed in harvested portion.)

TABLE 1. YIELD RESPONSE FROM LIME AND FERTILIZER ON OGDEN SOYBEANS

County	Soil Type	No Lime		1 Ton Lime [1]				Least significant difference (.05)
		No fertilizer	400 lbs. 0–10–20	No fertilizer	200 lbs. 0–20–0	160 lbs. 0–0–50	400 lbs. 0–10–20	
		Bu/A	Bu/A	Bu/A	Bu/A	Bu/A	Bu/A	Bu/A
1. Edgecombe (Whitehurst)	Norfolk loamy fine sand	5.0	22.1	2.6	4.9	19.8	31.9	2.0
2. Edgecombe (Satterthwaite)	Wickham sandy loam [2]	18.7	17.8	16.0	20.9	19.3	22.6	1.9
3. Halifax (Garner)	Norfolk sandy loam	29.0	31.3	32.5	31.9	32.4	39.3	2.8
4. Halifax (Pierce)	Wickham sandy loam	25.7	26.8	30.1	29.9	30.8	31.6	2.7
5. Jones (Duval)	Craven very fine sandy loam	25.3	27.8	22.8	26.0	26.7	33.1	1.8
6. Beaufort (Slack)	Portsmouth sandy loam	18.2	33.2	22.4	21.9	32.6	33.3	2.2
7. Beaufort (Bragg)	Portsmouth sandy loam	11.3	17.4	21.6	30.9	24.4	31.5	1.8
8. Duplin (Wells)	Dunbar fine sandy loam	22.5	22.4	32.8	34.2	37.7	37.7	1.8
9. Pasquotank (Harris)	Elkton silt loam	42.4	46.3	42.0	42.1	44.1	48.3	2.7
AVERAGE YIELDS		22.0	27.2	24.8	27.0	29.7	34.4	
Increase for treatment		.....	5.2	2.8	5.0	7.7	12.4	

[1] Two tons lime on experiment No. 7.
[2] Very dry.

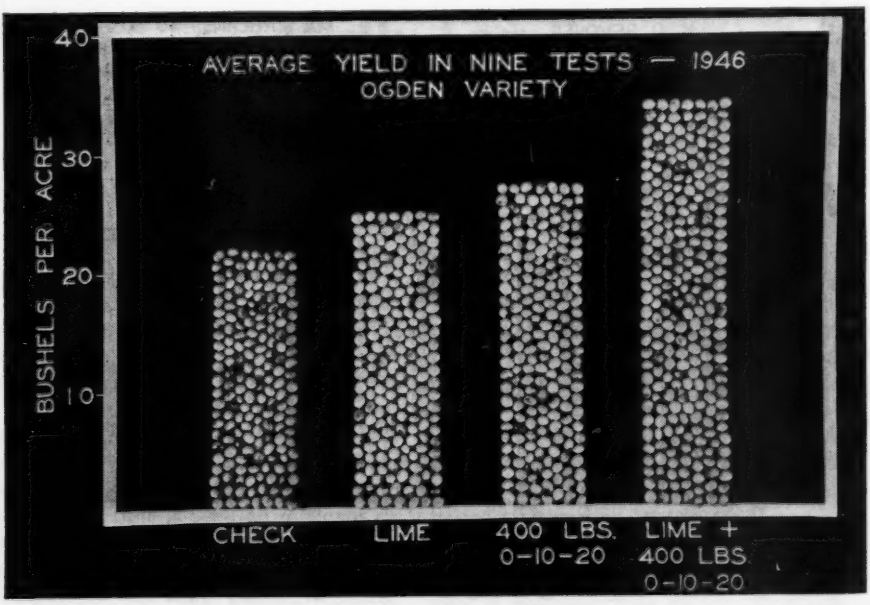

Fig. 3. Lime and fertilization with 400 pounds 0-10-20 per acre increased the yields of soybeans to 34 bushels per acre. (Average of nine experiments in 1946.)

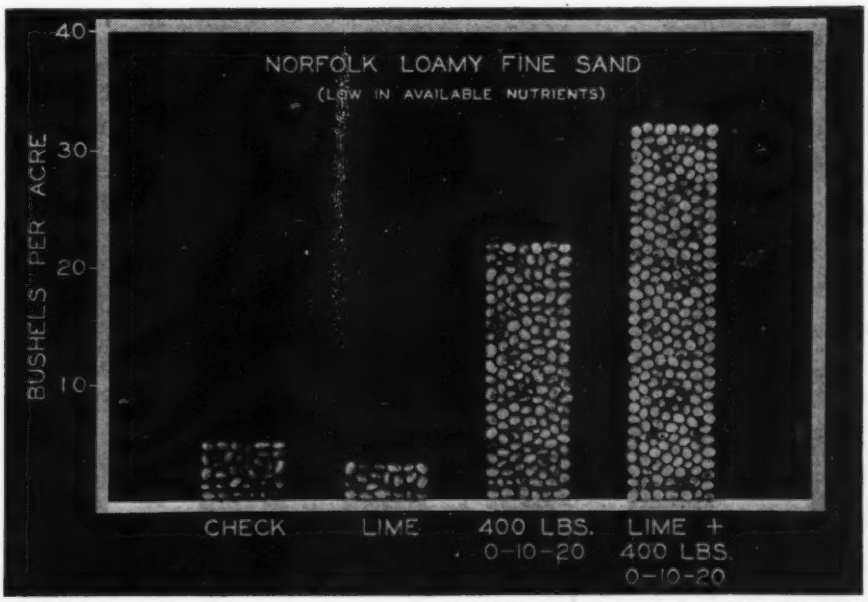

Fig. 4. Soybean yields were increased from 5 bushels per acre on the check plot to 32 bushels when lime and fertilizer were applied on this infertile Norfolk loamy fine sand. (Same location is shown in Fig. 1.)

bushels, and potash alone, 4.9 bushels; but both of them together increased yields 9.6 bushels.

The response of soybeans to applications of lime, phosphorus, and potash on any particular soil is of course related to the amounts of nutrients in that soil. The soil analyses are given in table 2. At location No. 6 there was no response to dolomitic limestone. The soil at this location contained the highest amounts of calcium and magnesium. In general, the greater the amount of phosphorus and potash in these soils, the less the yield response of soybeans to applications of these nutrients. Other environmental factors complicate this relationship, however.

Soils now producing very low yields will produce well if treated properly. For example, in the experiment in Edgecombe County on a Norfolk loamy fine sand very low in plant nutrients, particularly potash, a yield of 5.0 bushels per acre was obtained with no fertilizer or lime (fig. 4). With lime and fertilizer, 31.9 bushels were produced. The quality of the beans was also much improved by the lime and fertilizer. Past results have shown that this effect on quality is due principally to the potash.

In the experiment in Pasquotank County on Elkton silt loam, a yield of 42.0 bushels was obtained with no lime or fertilizer (fig. 5). Ordinarily it would be thought that with a yield such as this there would be no response from additional nutrients. When lime and 400 pounds of 0-10-20 were applied, however, a yield of 48.3 bushels per acre resulted. This soil contained the highest amounts of exchangeable potash and available phosphorus.

The returns in dollars from the average yields of soybeans in the experiments are given in figure 6. The greatest opportunity for profit comes with adequate liming and fertilization. The returns on Portsmouth sandy loam (Bragg) are shown in figure 7. With no treatment, this soil yielded 11.3 bushels or very close to the State average. With lime and fertilizer, the yield

TABLE 2. SOIL ANALYSES IN SOYBEAN TESTS

Experiment No.	pH	m.e. per 100 gm.				Sol.P ppm
		Ex. Cap.	Ex. Ca	Ex. Mg	Ex. K	
1.....	5.83	2.0	0.75	0.28	0.025	37
2.....	5.67	2.0	0.59	0.20	0.030	37
3.....	6.15	1.3	0.58	0.35	0.057	36
4.....	5.87	1.5	0.69	0.20	0.025	65
5.....	5.50	3.6	0.73	0.29	0.080	32
6.....	5.63	11.6	3.27	1.04	0.029	22
7.....	5.15	11.0	1.14	0.30	0.037	24
8.....	5.2	7.2	2.02	0.51	0.10	33
9.....	5.2	9.1	1.41	0.27	0.18	72

was nearly tripled and a net return of $47.35 per acre was obtained.

Deficiency Symptoms

Symptoms of starvation for plant nutrients, particularly potash, are common on soybeans. When these signs appear it is not too difficult to convince the soybean grower to apply what is needed. Unfortunately, for every acre of soybeans that shows these outward signs of deficiency there are many other acres that have no visible deficiency symptoms but nevertheless are suffering from want of plant nutrients. An example of this is in the Duplin County experiment in which there were no visible deficiency symptoms or even growth responses at any time during the active growing season. The untreated beans, however, yielded 22.5 bushels per acre while lime and fertilizer increased the yields to 37.7 bushels. In most of the 1946 experiments there were no definite recognizable symptoms of deficiency.

If soybeans are grown on a deficient soil, fertilizer must be added in order to get a good crop. On the other hand, if soybeans are grown on a soil well supplied with nutrients, reasonably high initial yields may be obtained. However, the continued growing of soybeans on such a soil without additions of fertilizer will eventually deplete the soil and unprofitable yields of soybeans will result.

Hence, the safest practice for the

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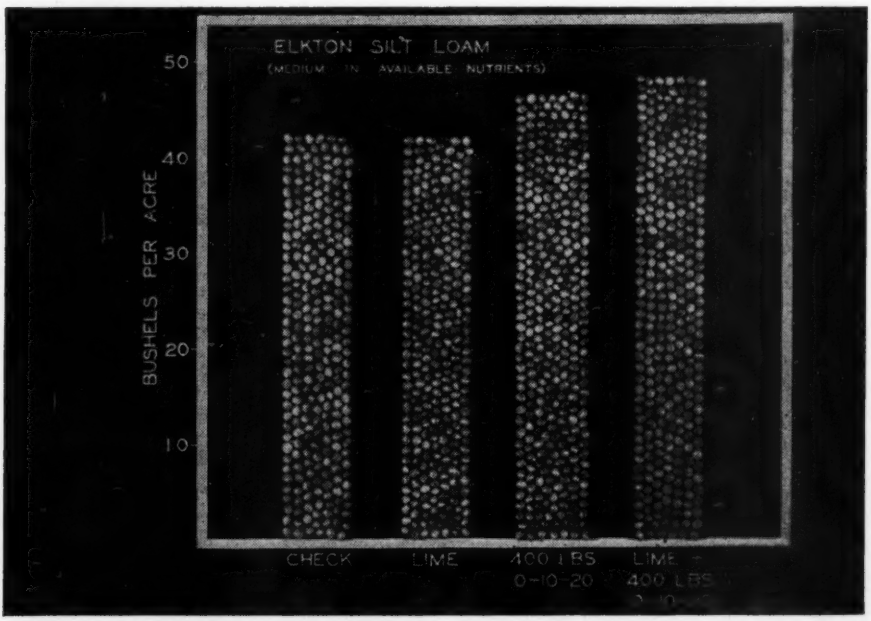

Fig. 5. Even with a relatively high yield, lime and fertilizer increased the yield of soybeans six bushels per acre. (Elkton silt loam.)

Fig. 1. Grassland farming, started nearly 30 years ago by Mr. Wheelock, is now being continued by his son, Wilder, Jr. This year the Wheelocks plan to start reclaiming over 20 acres of marshlands.

The Wheelocks of Vermont Grow Grass

By Jack Spaven

Extension Service, University of Vermont, Burlington, Vermont

A PAIR of ice-skates, an early spring thaw, and a neighbor's cornfield all played a part in convincing Wilder Wheelock, Vermont dairyman, that grassland farming pays off in greenbacks.

It was nearly 30 years ago, long before soil conservation as we know it had started, that Mr. Wheelock noticed the results of the plow. He had taken one of his youngsters down to the farm pond for an hour of ice-skating. The skates were never used, however, because the ice on the pond was covered with a generous layer of rich topsoil eroded from his neighbor's cornfield.

There goes part of Jim Dykes' farm, he thought. The same thing is happening to my land. The rains, spring thaws, and floods are stealing the best soil on these farms. In the spring his cornfield was seeded to grass. After that the Wheelocks' plow stood idle. As the dust on the plow thickened, so did the Wheelock's faith in grassland farming grow.

Today not one of the 180 acres is turned by the plow. The farm is in permanent pastures and haylands. What are the results? Mighty good, say the

Wheelocks, and their farm account books prove it.

Last year they produced 10 pounds of milk for every pound of grain bought. In other words, the 30 milking cows produced 200,000 pounds of milk and only 10 tons of grain were bought. This year they hope to stretch the ratio to 12 pounds of milk from each pound of grain—an unusually high goal, but right now it looks as though they will make that figure.

The elder Mr. Wheelock and his son, Wilder, Jr., keep about 30 milking cows and 20 head of young stock on what they call their "mineralized hay."

"We use plant food and plenty of it," they say, "and the results speak for themselves."

An example of the potency of this so-called "mineralized hay" is shown by the fact that recently the Wheelocks sold 15 tons of hay to a neighbor who milks 60 head of dairy cows. In a few days, the neighbor's milk production jumped 200 pounds a day.

Hay and grass ensilage samples tested at the Agronomy Department of the University of Vermont and State Agricultural College show that they are exceptionally high in protein. Tested on a dry-matter basis, the samples rated about four per cent digestible protein, which makes it good feed.

The Wheelocks use a good supply of lime, superphosphate, complete fertilizers, and some straight nitrogen.

"We always leave check plots in our pastures and meadows, small plots where no fertilizer is used. It makes us feel as though we are getting more than our money's worth when we can see the difference between the check strips and the fertilized pastures and haylands," points out Wilder, Jr.

"We raise our crop of grass just as we would potatoes, corn, or grain. Even in a dairy state like Vermont, too many farmers use their poorest land for pastures and do not do anything to keep the pastures in high production. We find that grassland farming is much easier than growing corn and other crops. Our labor needs are reduced, we spend less on machinery, and we can harvest our ensilage in spite of the weather. If some farmers would take part of the money they put in big grain bills, invest it in fertilizers, and concentrate more on growing better grass, they'd be further along than they

(*Turn to page* 41)

Fig. 2. This early hay crop was used as grass ensilage. The Wheelocks are known throughout Vermont for their "mineralized hay."

Fig. 1. Soil conservation began to spread fast in the Fork Shoals Road community after District Supervisor S. B. Huff called this meeting of his neighbors at his home.

Community Cooperation in Soil Conservation

By James H. Talbert

District Conservationist, Spartanburg, South Carolina

SOIL conservation builds community action, and community cooperation speeds soil conservation. I've seen it working both ways in the three South Carolina Piedmont soil conservation districts which I serve as a district conservationist for the Soil Conservation Service.

So successful has been the group approach to soil conservation in one community in each of the three districts that hundreds of farmers, agricultural leaders, and many visitors from foreign countries have gone to the communities during the past year to see the results for themselves.

Then William A. Townes, publisher of the Spartanburg, South Carolina, *Herald-Journal,* heard about the communities, studied them, and liked the idea so well that he wanted to encourage other communities to use the same methods of saving and building their lands. To do that, his newspapers offered $7,248 in equipment prizes to groups of farmers in a two-year soil conservation contest in cooperation with district supervisors. Several weeks before contest entries closed, 72 different groups of 10 to 20 farmers in three districts joined the competition.

But that is getting ahead of this story.

Let's go back to the beginning in February 1944.

At that time the supervisors of the Broad River Soil Conservation District, covering Union, Spartanburg, and Cherokee Counties, invited the supervisors of the Greenville and Laurens Districts and agricultural workers to meet with them to discuss ways to speed soil conservation work. E. C. McArthur, a supervisor of the Broad River District and now President of the National Association of Soil Conservation District Governing Bodies, proposed that each district assist farmers on a community basis to establish a pattern of conservation farming. This pattern, he explained, would serve as a "show window" to encourage other groups of farmers.

S. B. Huff of the Greenville District reported that his own community of Fork Shoals Road already had done some mighty fine soil conservation work and that he would like for the other supervisors to see it.

In May when the contour strips of ripening grain and young cotton and corn were making a beautiful pattern of soil conservation, the three boards of supervisors, Soil Conservation Service technicians, county agents, and vocational agriculture teachers went to the Fork Shoals Road community in Greenville District. There they found 40 different farms grouped closely together where practices had been carefully planned and applied to fit the land and improve the soil. They visited the farms of Supervisor Huff and of W. M. Kellett. On each of these farms, the owner and Soil Conservation Service Technician H. Granade explained the district farm plan and pointed out the changes in land use and the various types of treatment applied.

Huff explained how it came about: "A few farmers, including Mrs. Nelle K. Hopkins, W. M. Kellett, and I had a pretty fair soil conservation program started on our farms as a result of help from the Soil Conservation Service CCC Camp. When we farmers organized our soil conservation district in 1940, I was elected a supervisor. Hugh Dowdle, who was our District Conservationist then, and Granade talked to me about inviting my neighbors to my

Fig. 2. Here is the new soil conservation pattern on the farm of Mrs. Nelle K. Hopkins, one of the first Fork Shoals Road farm-owners to make the change with help from the Greenville Soil Conservation District.

house to hear the district program explained and to study the practices on my own farm. We had this meeting in May 1940 with 15 farmers present and decided to have another meeting on an unplanned farm for the purpose of planning it together. After this second meeting, all the group had a pretty good knowledge of a soil conservation district plan. This started the ball rolling, and now we are proud to say that we have 40 farmers in this one community cooperating with our district."

All the supervisors went home convinced of the need of having at least one community to serve as a "show window."

Midway Community in Cherokee County was chosen by the Broad River Board, Hopewell by the Laurens Board, and, quite naturally, Fork Shoals Road was selected by the Greenville District Supervisors.

Further Organization

The next step was for the supervisors of each district to invite farmers from the selected community to a meeting where they explained the plan and offered all the assistance available from the district in helping them to get this new pattern of conservation applied on a community basis as rapidly as possible. Supervisors and farmers discussed what soil conservation farming would mean to the community and to each individual.

In every case, the farmers voted to start a community soil conservation program. Each group elected its own leader: C. F. Swofford in Midway, W. P. Dickson in Hopewell, and Drayton Hopkins, son of Mrs. Nelle K. Hopkins, in Fork Shoals Road.

After they had formed their own organizations, 26 farmers in Midway, 30 in Hopewell, and 35 additional farmers in the Fork Shoals Road community applied to their district supervisors for farm conservation plans. In each community the Soil Conservation Service technician kept in close contact with the community leader and helped him to determine the need for various types of meetings. Both the Hopewell and Midway groups visited the farmers in Fork Shoals Road to see first hand the pattern of conservation farming there. Soon there was rivalry among the groups to see which could make the best record. In each community, the leader called meetings where representatives of various agricultural agencies discussed different soil conservation practices, showed slides and motion pictures, and explained the meaning of a complete soil conservation farm plan. Within a short while every farmer had made a plan with help from the technician and the plan was going on the ground.

Farmers were encouraged by the praise they received from leading business men, including newspaper editors, bankers, farm machinery dealers, and others. For example, the Campbell Limestone Company of Gaffney and the Production Credit Association of Clinton each published a half-page advertisement in local papers congratulating the farmers in these communities. Soon many visitors began going to each community.

In 1945, a group of farm magazine editors visited the Hopewell and Fork Shoals Road groups. One of the editors asked a farmer what had happened to bring about all the soil conservation farming he'd seen. The farmer's answer was "A 'Granade' burst in this community"—meaning, of course, H. Granade, the technician.

In Fork Shoals Road W. M. Kellet's store is the meeting place for farmers in the community. This rural store owner sells soil conservation with practically every bill of groceries. Let Mr. Kellett tell the story from the beginning:

"I used to run a lot of terrace lines for my neighbors. One of them is Mrs. Nelle K. Hopkins, who is a widow. Nearly every winter I would run terrace lines, and the tenants on

Fig. 3. M. W. Goforth, leader of the High Point conservation group in Cherokee County of the Broad River District, and I. B. Webber, SCS technician, discuss conservation farm planning. Mr. Goforth then helped to take this information to the members of his group participating in the Herald-Journal district contest.

her farm would throw up little ridges. By the time winter came around again, these little ridges would be broken. Finally I told Mrs. Hopkins—'your farm is gone—it's just washed away.'

"I don't know how Mrs. Hopkins heard about Granade, but one day she had him out there on her farm making a soil conservation plan.

"The first real difference I noticed on the Hopkins farm was when they put a big machine into the fields and built some real terraces. Kudzu was planted in the swags where the terraces ended. They ran the rows with the terraces. Then they planted the fields in strips of small grain and strips of row crops like cotton or corn. I noticed there was a lot less cotton and a lot more small grain on the farm, and the small grain was overseeded with lespedeza.

"I didn't know this fellow Granade, but I went to Greenville and looked him up. About all I could think of at the time was a bale of cotton, and I was scared to death that the plan we made would cut me out of a bale of cotton. I was growing 40 or 45 acres of cotton every year, making 24 or 25 bales. The rest of my fields were in corn and a little bit of small grain.

"My soil conservation plan called for about 25 acres of cotton, and the rest in small grain overseeded with lespedeza.

"I was still thinkinig about a bale of cotton, and I didn't follow the plan very closely the first two or three years. I did just enough of it to keep Granade helping me. Pretty soon my cotton yields began to go up, and I kept on cutting down the land in cotton. Last year we harvested 28 bales on 25 acres, and we had grain and lespedeza extra. That was more cotton than I used to make on 40 or 45 acres.

"Well, you see that's just the way it went. Each farmer watched to see what the other farmer did, and it wasn't long until we organized a group so that we could help ourselves while the district helped us. And now we have 80 farms under soil conservation plan with the district, and most of these farms touch another farm in the group somewhere."

Other Examples of Success

Last summer Mr. Huff reported the increased yields on his farm when a group of Federal Land Bank officials visited him: Cotton from 300 to 400 pounds an acre, corn from 15 to 25 bushels, oats from 20 to 40 bushels, wheat from 15 to 25 bushels. These increases, he explained, were mainly due to good terraces and the rotation of small grain with lespedeza on the land in contour strips every other year. He added that he is now growing 15 acres of sericea and three acres of kudzu in draws where terraces empty and on steep areas. From the 40 acres of annual lespedeza he said he was getting a ton of hay to the acre, or 400 pounds

of seed an acre. And he climaxed his report to the bank officials with this comment, "Gentlemen, your clients are going to have to practice soil conservation or you are going to have to go out of business."

Drayton Hopkins' records show these changes in crops grown, acreages, and yields:

	ACRES		ACRE YIELDS	
	Before	After	Before	After
Cotton	134	100	290 Lbs.	500 Lbs.
Corn	183	50	10 Bu.	30 Bu.
Oats	80	120	20 Bu.	75 Bu.
Wheat	7	20	10 Bu.	25 Bu.
Barley	None	20	None	40 Bu.
Annual lespedeza seed	None	140	None	500 Lbs.

Two new crops on this farm don't fit very well into a table, because of their multiple uses. Hopkins' 30 acres of sericea lespedeza produce a ton of hay and 300 pounds of seed an acre from 16 acres, and the other 14 acres are used for grazing. Fourteen of the 25 acres of kudzu produce two tons of hay an acre, and the remaining 11 acres are used for grazing.

Mr. Swofford, the Midway leader, has done an outstanding soil conservation job on his own farm and at the same time has helped his neighbors. He modestly tells visitors that he is now making 90 bales of cotton on 60 acres and explains it this way:

"I haven't used a turn plow in 15 years. Before I got a tractor and a scarifier last year, I used to cross break my land with a bull tongue plow. My reason for doing away with the turn plow was that I noticed where litter is left in the first inch or more of the soil, the land is soft like a new ground, and where I turned the litter under, the land was hard on top and didn't hold moisture as well. I also find that since using lespedeza and not turning my land, I have very little crabgrass because the lespedeza shades out the grass."

As for strip-cropping, which is a new practice on the farm, Mr. Swofford commented: "It is not a question of liking it or not liking it. My purpose in farming is to make a living, and some money if possible, and at the same time protect my land. And if it takes strip-cropping to do it, that's what I am going to do."

Visitors to Midway community always stop at the E. C. McArthur farm, which is probably among the best examples of soil conservation farming to be found anywhere. Every acre is being used properly and treated according to its needs. Assuming that anybody can see the program on the land, Mr. McArthur talks about the soil conservation district program while the visitors are looking. He always emphasizes the need for other communities in districts to get similar programs under way, and in every case he offers his assistance.

Agricultural workers are finding it easier to help more farmers each year when the farmers have formed their own organization, as Midway, Hopewell, and Fork Shoals Road have. Wayne LeMaster, Soil Conservation Service technician in Cherokee County since the beginning of the district program in 1937, said that it is easier now for him to assist 80 additional farmers each year than it used to be to work with 25 new farmers in a year.

Farmers in the Hopewell community, reported H. A. Ropp of the Laurens County Field Service Branch (AAA), earned 98.7 per cent of their 1945 AAA

allotments as compared with the county average of 75.9 per cent. And he added that the Hopewell farmers were shooting for a perfect score in 1946; they signed up for practices which would earn 100 per cent of their allotment.

When W. P. Dickson, Hopewell leader, and Ryan Lawson, a district supervisor living in the community, call a meeting, they can be assured of a good attendance. Why? One farmer answered, "We know that it will be our own meeting and that we can speak as we please. We also know that we are going to get our favorite fish stew, or some other mighty good dish cooked by one or more of our own neighbors."

All these flowing reports of community success with soil conservation make it appear to be an easy job. But the accomplishments didn't happen by accident; they resulted from sound and careful planning by district supervisors and other farm leaders, from the cooperation of agricultural workers, from the community spirit developed by group action and from hard work on the part of individual farmers.

Not every man in each community was at first convinced of the need for either complete farm soil conservation or for group action. For example, a tenant farmer frankly told his neighbors at a meeting of the Fork Shoals Road Soil Conservation Club last summer: "I would like to say that I am sorry for the things that I have said against the soil conservation program. I would like to say here and now that I was wrong. Since carrying out these practices, it has been a great benefit to me and my family, making better yields and improving the land."

But the tenant who can see the better methods across the fence in most cases has been ready to team up before his landlord who lives at a great distance from the farm. For example, in Midway community there was a farm owned by a man living in California. He had held back until last summer when he visited in the community. Everywhere he turned he heard praise for soil conservation and good land use; more than that, he could see it. After a few days he went to the district su-

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Fig. 4. W. M. Kellett (left), who runs a country store and sells soil conservation with every bill of groceries, examines lespedeza in small grain stubble on the farm of his son, J. P. Kellett. They live in the Fork Shoals Road community and grow as much cotton as they used to harvest, but on half the land.

Fig. 1. Typical desert area before reclamation.

Corrective Measures for The Salinity Problem In Southwestern Soils

By W. T. McGeorge

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THE salinity problem met in the farming of Southwestern soils is one of major proportions in this section of the United States. Agricultural operations are confined largely to the alluvial valleys where the soils have been built up by rock debris eroded from the surrounding mountains. Except in the case of the large rivers, the waters which brought about this erosion either spread out in alluvial fans and went underground or deposited their salts in the soil by evaporation. In a semi-arid climate, such as exists in the Southwest, all virgin soils are therefore more or less saline and alkaline and must usually be reclaimed before cropping. Likewise, since rainfall and irrigation

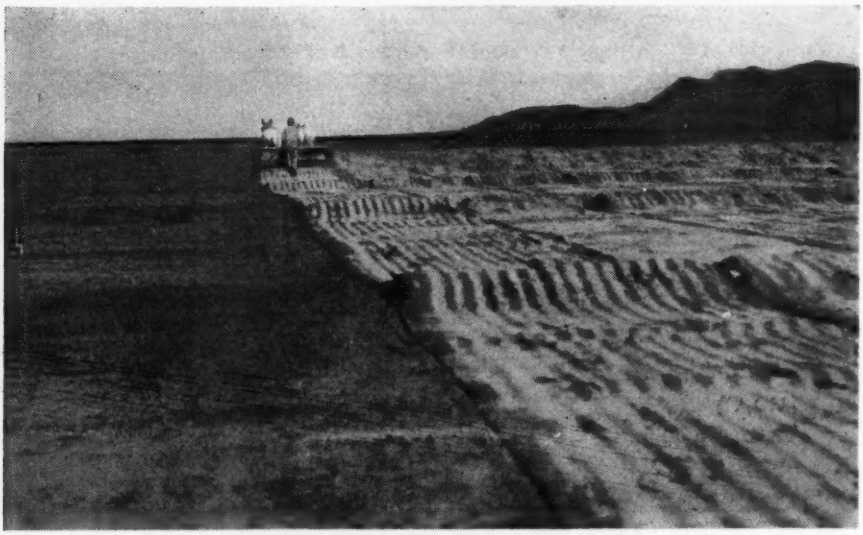

Fig. 2. Application of gypsum during reclamation.

add water to the soil under conditions where there is a high evaporation rate, salt accumulation will continue when these lands are put under irrigation unless a cultural program is adopted to control this hazard.

What Is Alkali?

As applied to semi-arid soils, the term alkali has no precise meaning for it covers too many conditions. Hilgard's early classification of alkali soils into white alkali and black alkali is still used by farmers. White alkali refers to the soils which contain an excess of neutral soluble salts, usually chlorides and sulphates. The term black alkali is applied to soils which contain an excess of sodium carbonate or adsorbed sodium. The former is identified in the field by an efflorescence of white salt and the latter by a black color of organic matter, humus being soluble in an alkaline soil solution. Recently in technical literature the terms saline and salinity have been used with reference to white alkali soils and the term alkali reserved only for those soils in which the pH is high enough to classify them as definitely alkaline.

Relation Between White and Black Alkali

At one time the white and black alkali soils were treated as totally different problem types more or less unrelated. Since both white and black alkali salts are soluble in water, reclamation was looked upon as a simple leaching operation. The fact that some of these soils could not be made productive by simple leaching was noted but could not be explained. Now we know the reason for these exceptions was simply that sodium salts react with the clay minerals to form alkali mineral salts which are not soluble in water and, therefore, cannot be leached out of the soil. In brief, base exchange studies disclosed that white and black alkali types are closely related in that an excessive adsorption of sodium by the clay minerals, from white alkali salts, will produce a sodium clay mineral which readily hydrolyzes to sodium hydroxide and ultimately may change to sodium carbonate. From this it is obvious why such soils cannot be reclaimed by simple leaching. An excess of soluble calcium must be present in the soil if all alkali soils are to be suc-

cessfully reclaimed by leaching and maintained in a permanently productive state.

Salinity-Alkali-Soil Relationships

Thanks to research in soil science we now have a thorough understanding and knowledge of the fundamentals regarding the formation of alkali soils, their reclamation, how to maintain them in a productive state, and finally the manner in which crop growth is affected by the chemical and physical properties which are characteristic of these soil types.

As already stated, saline and alkaline soils are closely related if sodium salts predominate in the soil solution or in the irrigation water being used. If the salines are calcium salts in major part, the salinity problem is a simple one. In these soils toxicity and high osmotic concentration of the soil solution are the only two undesirable conditions that can exist and these can be easily corrected by simple leaching. Calcium salts are strong flocculants and tend to maintain soils in a good physical condition. The troublesome alkaline or saline soils are almost entirely the soils in which an excessive adsorption of sodium, from the respective salts, has taken place. In rare cases soils are found in which an excessive adsorption of magnesium has occurred and, while these are not always alkaline, they have a poor structure.

When the adsorbing capacity of the clay minerals in the soil is in most part satisfied with sodium, the soil is classed as a black alkali soil even though an excess of white alkali may also be present. Practically all neutral salts are flocculants for the clay fraction of the soil. These salines can be washed out of the soil by simple leaching operations. But when these salines are present in excess in the soil, they tend to suppress the hydrolysis of sodium clay. Therefore when the salines are leached out, sodium hydroxide will be formed by hydrolysis, the soil colloids will swell and assume a gel-like structure, and the farmer is worse off than when the salines were present. This can be avoided by having soluble calcium salts present during leaching—a little matter of sodium:calcium ratio in the irrigation water, the soil solution, and the clay minerals.

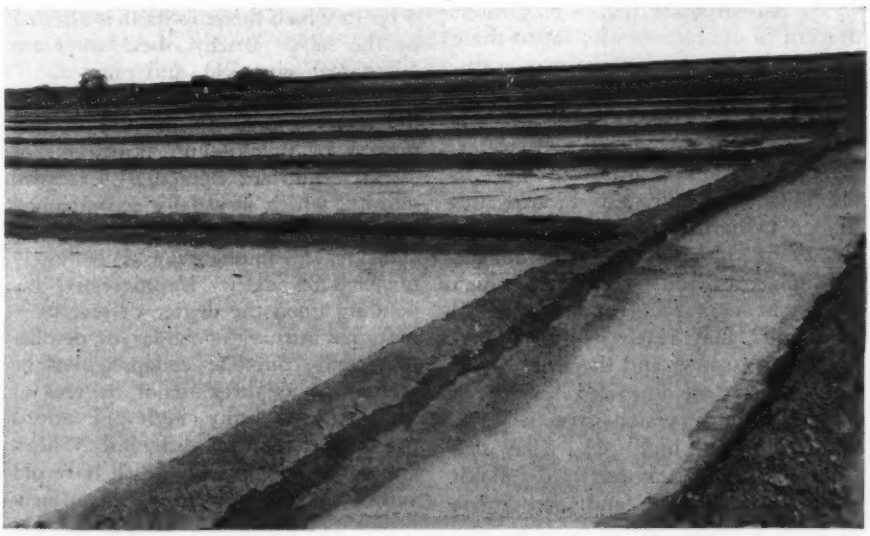

Fig. 3. Leaching operation following the incorporation of gypsum in the soil.

Fig. 4. Showing capillary salt line on a cantaloupe bed. Planting is made below the salt line.

While it is true that the high pH characteristic of black alkali destroys the root tissue, this toxicity is not the major problem which alkaline soils present. That is, excessively alkaline soils must be reclaimed before any attempt is made to profitably crop them. It is the harmful effect of only traces of sodium carbonate or adsorbed sodium on the soil structure that is of greatest concern to the farmer who farms these alkaline lands. Such soils become dispersed and puddle easily, rate of water penetration is reduced, and the soils become water-logged. When water-logged, aeration is impaired and, in the absence of air, the bicarbonates change to normal carbonates with increases in pH. Under water-logged conditions, calcium carbonate, which is present in varying amounts in all these soils, may reach its full pH of 9.6. Root growth and therefore foraging activities are impaired because of the colloidal dispersion, structural deterioration, and high pH. Clay pan tends to form as the dispersed colloids elutriate downward and accumulate to form a dense subsoil horizon, and the micropopulation of the soil becomes largely anaerobic. In short, the soil becomes entirely unsuited for crop growth.

Salinity-Alkali-Plant Relationships

Before discussing some of the practical corrective measures employed in the husbandry of alkaline and saline soils, it may be advisable to discuss the ways in which the crop itself is affected by the salts. Briefly, these ways are nutritional, chemical, and physical.

Nutritionally both salinity and alkalinity, high pH, disturb the normal process of uptake and utilization of essential nutrient elements. Excessive salinity, which is usually accompanied by an excessive uptake of sodium, chloride, and sulphate ions, is definitely toxic. This toxicity is progressive depending upon the degree of severity—marginal burning of the leaves, defoliation, and complete collapse may be mentioned as three major degrees of severity. Alkalinity, high pH, affects the plant somewhat differently. Most crops feed best in soils which have pH values that closely approximate neutrality, pH 7.0 $\pm$ 0.5. Within this pH

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Higher Corn Yields For Alabama

By L. O. Brackeen

Agriculture Extension Service, Auburn, Alabama

CORN is Alabama's biggest crop and her farmers are finding that per-acre yields can be much bigger.

During 1946, hybrid corn came more into the spotlight. Alabama test demonstration farmers made yields ranging from 30 to 131 bushels per acre, the majority making 60 to 80 bushels, on more than 400 farms scattered over the State. These crops were planted on land formerly producing only 15 to 25 bushels of open-pollinated corn.

From these tests farmers realize that corn yields can be doubled and tripled by use of more fertilizer, winter legumes, crop rotations, better varieties, and by planting on better land at the right time.

Three Alabama farmers who followed these practices in 1946 are J. P. Hannon, G. A. Swearingen, and A. D. Ray of Shorter, Alabama. They produced an average of 61.4 bushels of corn per acre on 113 acres. If all Macon County farmers had used the same method in producing their corn last year, the County's corn production would have been increased about 2½ million bushels, according to the estimates of M. F. Whatley, County Agent. With corn selling at $1.50 per bushel, the increase in corn income would have been $3,750,000.

Never before have Alabama farmers throughout the State showed such fine interest in doing a better job of growing corn as they are showing this year. Last year corn projects were carried out with the purpose of fully utilizing findings of the Alabama Experiment Station's exhaustive research on corn.

Results from experiments conducted at the Station located in Auburn show that if corn does not follow a good crop of winter legumes or well-fertilized cotton, an application of 200 to 300 pounds of 4-10-4 or 4-10-7 per acre should be made at planting time. Also it should be side-dressed with an application of nitrogen equivalent to 150 to 225 pounds of nitrate of soda, 120 to 180 pounds of ammonium sulphate, or 75 to 115 pounds of ammonium nitrate per acre.

If corn follows a good crop of winter legumes, the Station recommends that no additional fertilizer be used. If it follows well-fertilized cotton or other crop, only a side-dressing of nitrogen is recommended.

When a hybrid is planted, it is recommended that it be spaced more thickly than open-pollinated varieties. A suggested spacing for hybrids is 15 to 24 inches apart in the row with rows 3½ feet apart.

The Station has conducted a number of tests with high rates of fertilizer and different hybrids and varieties. The results of these tests are not conclusive. However, they do indicate that spacing 12 to 18 inches apart in the row and high rates of fertilizer are essential for larger yields of corn. Thick spacing is very important for the early maturing hybrids.

These facts found by the Experiment Station and supplied to the farmer by the Extension Service, Alabama Polytechnic Institute, created so great an interest in corn that 400 demonstrations using high-fertilizer and thick spacing

resulted last year. It is now estimated that 2,300 adult and 4-H corn demonstrations will take place in 1947 compared with only 400 last year.

All demonstration plots are one acre or more. Experiment Station recommendations were used by the demonstrators. The amount of fertilizer used was 600 pounds of one of the following: 4-10-7, 4-10-4, or 6-8-4, depending on condition of soil at time of planting. Four hundred pounds of nitrate of soda or equivalent nitrogen from other sources were used 35 to 40 days after planting. Corn was planted 18 inches apart in 42-inch rows. One of the following hybrids was used: Funk's G-714, Tennessee 10, Louisiana 1030 and 1031, Florida W-1, or Pfiester and U. S. 13 in north Alabama. Most demonstrators using an open-pollinated variety planted either Mosby, Douthit, or Neal's Paymaster.

To show how a few of the Alabama farmers succeeded in a big way in growing more corn per acre last year, J. C. Lowery, API agronomist, gives the following facts:

In Walker County, Frank Estes produced 101 bushels per acre by growing pure Graham's Mosby corn and fertilizing with a complete fertilizer mixture and side-dressing with a heavy application of nitrate of soda.

C. S. Gatlin, Rt. 2, Ardmore, Limestone County, produced over 100 bushels of corn per acre. He planted the corn 16 inches apart in 3½-foot rows, applied 400 pounds of 4-10-7 fertilizer, planted Tennessee 15 hybrid corn, and side-dressed it with 200 pounds of ammonium nitrate.

John B. Moore, another farmer of Elkmont, Rt. 1, Limestone County, made over 100 bushels of corn per acre by applying 500 pounds of 4-10-7 fertilizer, planting Tennessee 10 hybrid, and side-dressing with 100 pounds of ammonium nitrate.

Jack Butler, a graduate of Alabama Polytechnic Institute, Auburn, and now a farmer in Fayette County, produced 922 bushels of corn on 14 acres, averaging 67 bushels per acre. Part of the field made as high as 96 bushels per acre.

Melville Sledge made 95 bushels of corn per acre in his corn production demonstration carried out on Black Belt soil in Hale County. Sledge used 600 pounds of 4-10-7 and planted a hybrid, Funk's G-714, on April 16. He side-dressed May 20 with 400 pounds nitrate of soda per acre.

In Winston County, H. E. McNutt averaged 91.2 bushels per acre on six acres. He applied 500 pounds of 4-10-7, planted his corn April 20, and side-dressed on June 1 with 175 pounds of ammonium nitrate. His land had been built up for several years by growing and turning vetch and crimson clover.

Other Winston farmers reporting high yields included W. R. Jones, J. N. Bailey, and H. L. Wilson, all of whom planted Funk's G-714 between May 1 and May 15. They used a complete fertilizer and side-dressed with nitrate of soda.

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Bennett Owen, Rt. 2, Enterprise, a 4-H Club member, in his one acre of hybrid corn. This Chilton County boy used 500 pounds of 4-10-7 and 500 pounds of nitrate of soda. Planting date was May 1. The hybrid corn was plowed three times.

Determining New and Better Fertilizer Ratios[1]

By A. C. Caldwell

Division of Soils, University of Minnesota, St. Paul, Minnesota

THE question has sometimes been asked, are the present fertilizer ratios meeting the needs of the soils and crops of today? It seems, upon investigation, that many of the present fertilizer ratios, like Topsy, "just grew," and it is difficult to find the scientific basis upon which many common ratios are formulated. In Minnesota, for example, the following fertilizer grades, among others, have been used on corn: 0-20-20, 0-20-10, 0-20-0, 4-24-12, 3-12-12, and 2-12-6.

Unquestionably, there are areas and farms on which any one grade would be found to be most suitable, but very often these fertilizers have been bought on price and availability of supply mainly, with not sufficient regard to soil type, past management, present cropping practices, soil conditions, and other factors which would appear to be important considerations in using fertilizers.

It is manifestly impossible to fashion a fertilizer which would be exactly right for each individual farm, or even small areas. However, it should be possible to suggest fertilizer ratios which would be more adaptable to crop needs, soil type, and cropping history than some which are in common use today. It was with these considerations in mind that a start was made in 1944 on determining suitable fertilizer ratios for corn on some of the soils of southern Minnesota.[2]

[1] Paper No. 2331 of the miscellaneous journal series, Minnesota Agricultural Experiment Station, St. Paul 1, Minnesota.

[2] This investigation is supported by funds provided by the Hormel Institute, Austin, Minnesota.

Factorial Plot Design

The problem was how best to determine the proper ratios for corn. While it might be suspected that some kind of a complete fertilizer would be found to be most suitable, it was thought that it might prove interesting to investigate the effects of individual nutrients and combinations of nutrients and their interactions, and to measure the relative importance of the major plant-food elements, nitrogen, phosphate, and potash. The general class of experiment known as "factorials" provides a plot set-up designed to facilitate the procurement of answers to the questions just mentioned.

R. A. Fisher (1) and F. Yates (2) have worked out plot designs and statistical analyses for a large number of types of factorial designs. The one selected for this study was a 3x3x3 design in which three fertilizers were used—nitrogen, phosphate, and potash —at three levels, in all possible combinations, yielding in all 27 different fertilizer combinations. This design was modified somewhat by what the statisticians call "confounding," a process in which the plots are so arranged that precision of estimating complicated effects is sacrificed in order to enhance the precision with which the main effects can be estimated.

An example of a ratio or two might help those who are not too familiar with statistical analysis to understand the scheme a little better. One fertilizer combination used was $N_0P_1K_2$ which represents a combination of no

TABLE 1. TREATMENTS AND RATIOS OF FERTILIZERS, AND YIELD AND MOISTURE CONTENT OF CORN IN A 3x3x3 FACTORIAL EXPERIMENT ON SIX FIELDS.

Plot number		Treatments Pounds plant food*			Fertilizer yield**		Increase	Moisture content	Increase or decrease
		Nitrogen	Phosphate	Potash	Ratio	Bu/Ac	Bu/Ac	%	
25.....	$N_2P_2K_1$	32	64	32	1–2–1	68.8	18.1	38.3	−4.2
26.....	$N_2P_1K_2$	32	32	64	1–1–2	68.2	17.5	39.1	−3.4
27.....	$N_2P_2K_2$	32	64	64	1–2–2	68.2	17.5	38.2	−4.3
18.....	$N_1P_2K_2$	16	64	64	1–4–4	65.7	15.0	39.3	−3.2
16.....	$N_1P_2K_1$	16	64	32	1–4–2	65.3	14.6	39.3	−3.2
17.....	$N_1P_1K_2$	16	32	64	1–2–4	65.0	14.3	39.4	−3.1
24.....	$N_1P_1K_1$	32	32	32	1–1–1	64.2	13.5	39.7	−2.8
9.....	$N_0P_2K_2$	0	64	64	0–1–1	63.2	12.5	39.3	−3.2
15.....	$N_1P_1K_1$	16	32	32	1–2–2	62.7	12.0	39.9	−2.6
7.....	$N_0P_2K_1$	0	64	32	0–2–1	61.7	11.0	39.9	−2.6
21.....	$N_1P_2K_0$	32	64	0	1–2–0	59.6	8.9	39.1	−3.4
8.....	$N_0P_1K_2$	0	32	64	0–1–2	59.6	8.9	40.7	−1.8
6.....	$N_0P_1K_1$	0	32	32	0–1–1	58.6	7.9	41.3	−1.2
20.....	$N_1P_1K_0$	32	32	0	1–1–0	58.4	7.7	39.1	−3.4
3.....	$N_0P_2K_0$	0	64	0	0–1–0	57.6	6.9	39.7	−2.8
11.....	$N_1P_1K_0$	16	32	0	1–2–0	57.3	6.6	39.6	−2.9
12.....	$N_1P_2K_0$	16	64	0	1–4–0	57.1	6.4	40.2	−2.3
4.....	$N_0P_0K_1$	0	0	32	0–0–1	55.5	4.8	42.4	−0.1
23.....	$N_2P_0K_2$	32	0	64	1–0–2	55.5	4.8	43.2	+0.7
22.....	$N_2P_0K_1$	32	0	32	1–0–1	55.4	4.7	43.6	+1.1
2.....	$N_0P_1K_0$	0	32	0	0–1–0	54.9	4.2	40.0	−2.5
13.....	$N_1P_0K_1$	16	0	32	1–0–2	53.8	3.1	42.6	+0.1
14.....	$N_1P_0K_2$	16	0	64	1–0–4	53.5	2.8	44.4	+1.9
5.....	$N_0P_0K_2$	0	0	64	0–0–1	53.4	2.7	43.0	+0.5
10.....	$N_1P_0K_0$	16	0	0	1–0–0	52.2	1.5	42.8	+0.3
1.....	$N_0P_0K_0$	0	0	0	0–0–0	50.7	.....	42.5	.....
19.....	$N_2P_0K_0$	32	0	0	1–0–0	50.1	−0.6	43.4	+0.9

* Pounds plant food per acre applied in hill at planting time.
** Yield based on 15.5 per cent moisture.

nitrogen, phosphate at one level, and potash at a second level. The ratio $N_2P_2K_1$ would be a combination of nitrogen, phosphate, and potash at levels indicated by the subscripts. The levels, or in other words, rates, of individual nutrients can be chosen arbitrarily, and they need have no relation to one another. In this study nitrogen at the "one" level (N_1) meant an application of 16 pounds of nitrogen per acre; P_1 indicated 32 pounds of phosphate, and K_1 was 32 pounds of potash per acre; N_2 meant 32 pounds of nitrogen, P_2 was 64 pounds of phosphate, and K_2 denoted 64 pounds of potash per acre. $N_0P_0K_0$ indicated no fertilizer at all, of course.

Soil Types Investigated

This type of experimental design was used in quadruplicate on each of three farms in 1944 and 1945. The soil types on which these plots were placed was a Rockton silt loam, which consists of up to three feet of Iowan till over limestone, and Carrington silt loam, also formed on Iowan till. Both are black prairie soils. Tests indicated that these soils were quite acid in reaction, around pH 5 in the top foot. The nitrogen content varied around 0.2 per cent, and quick tests showed phosphate to be low generally and potash low to medium.

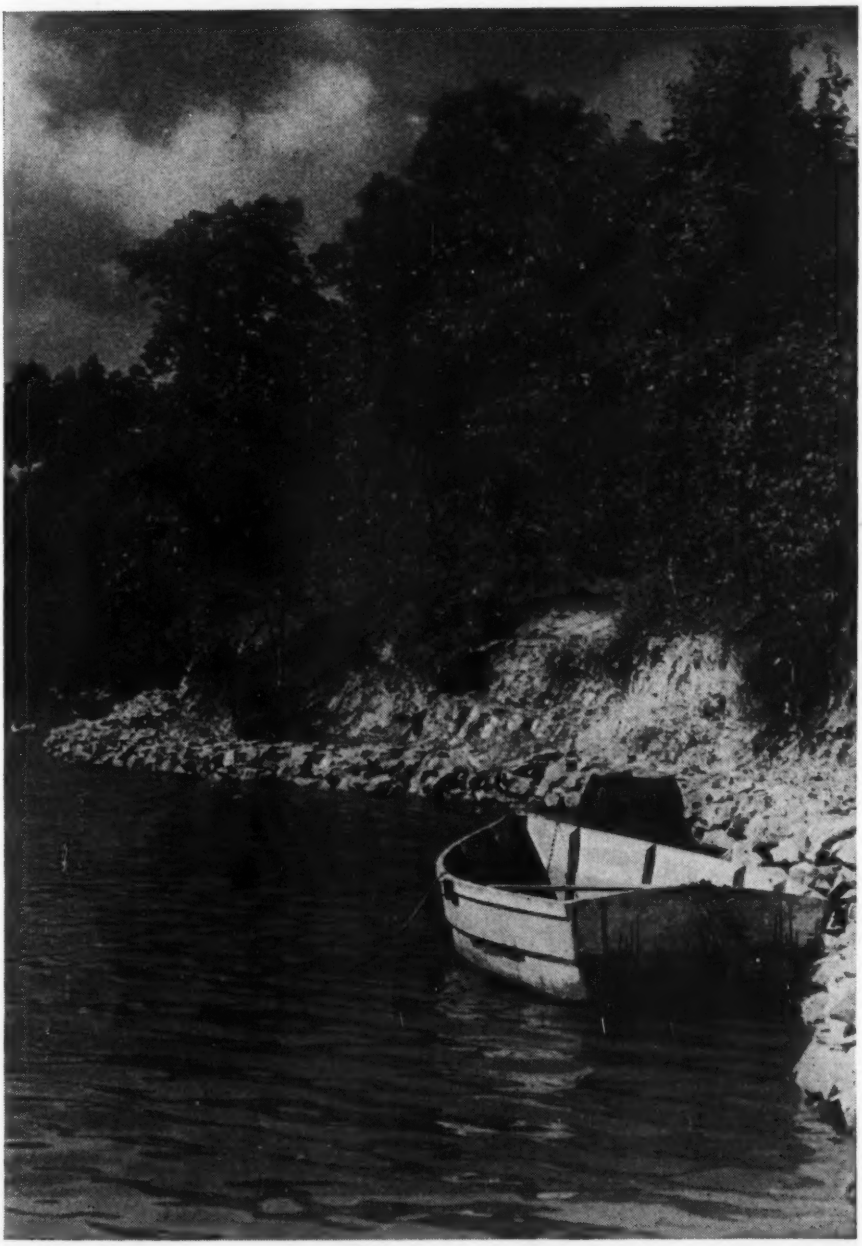
The corn was planted and fertilized by hand-operated machines. Plots were thinned to a uniform stand, and hills with the same number of stalks were harvested.

Yields and Moisture Contents

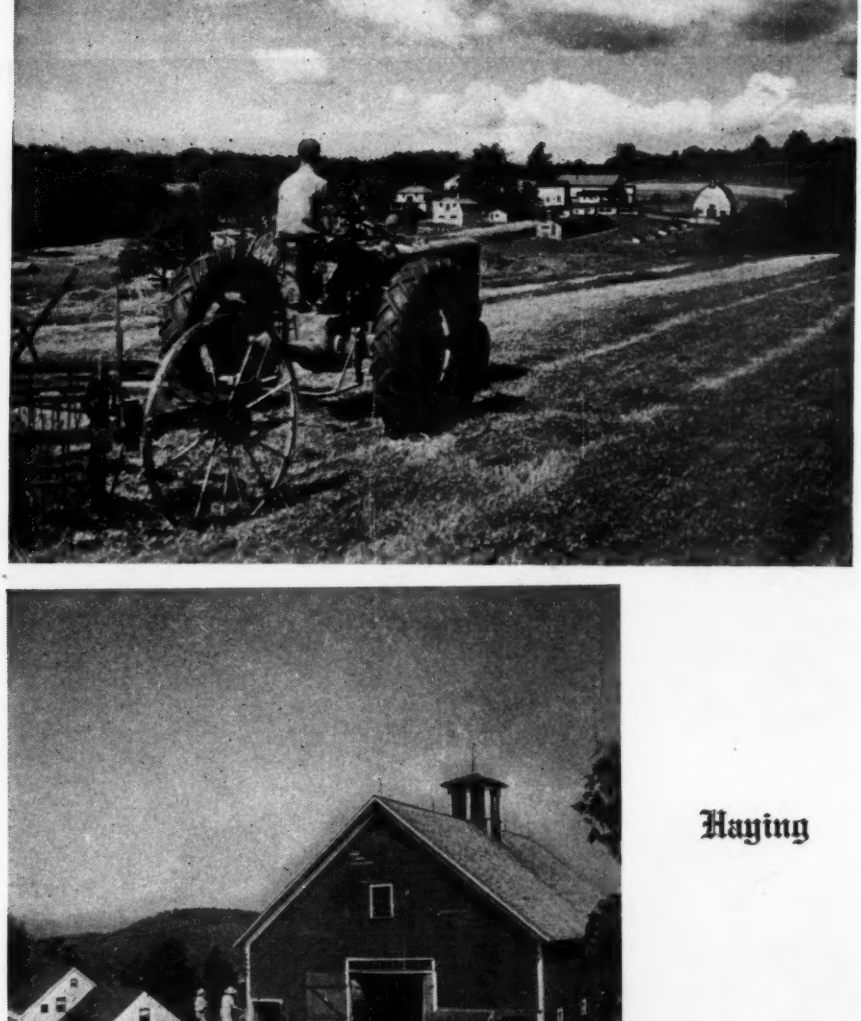
While soil types and past history varied in the six fields (three in each

(*Turn to page* 42)

PICTORIAL

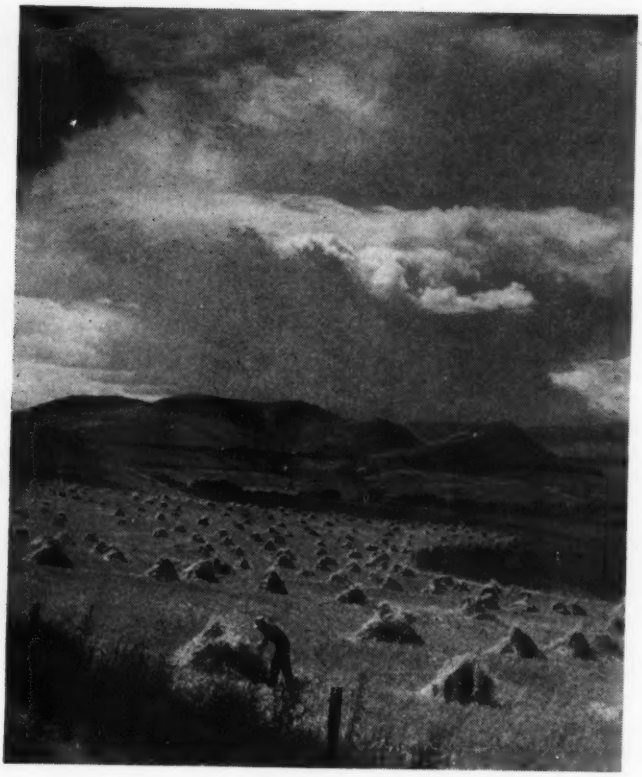


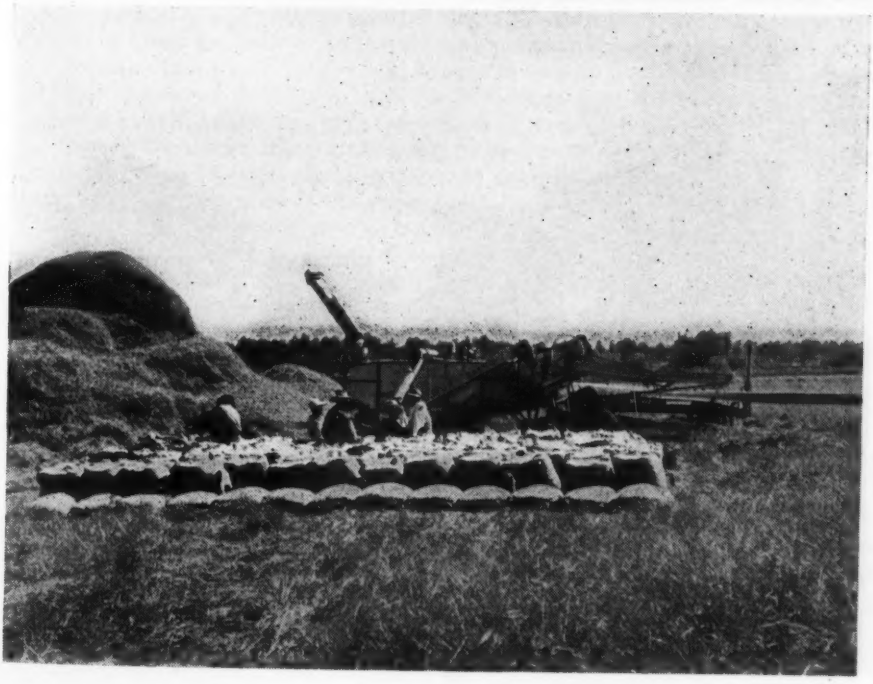
A SILENT INVITATION

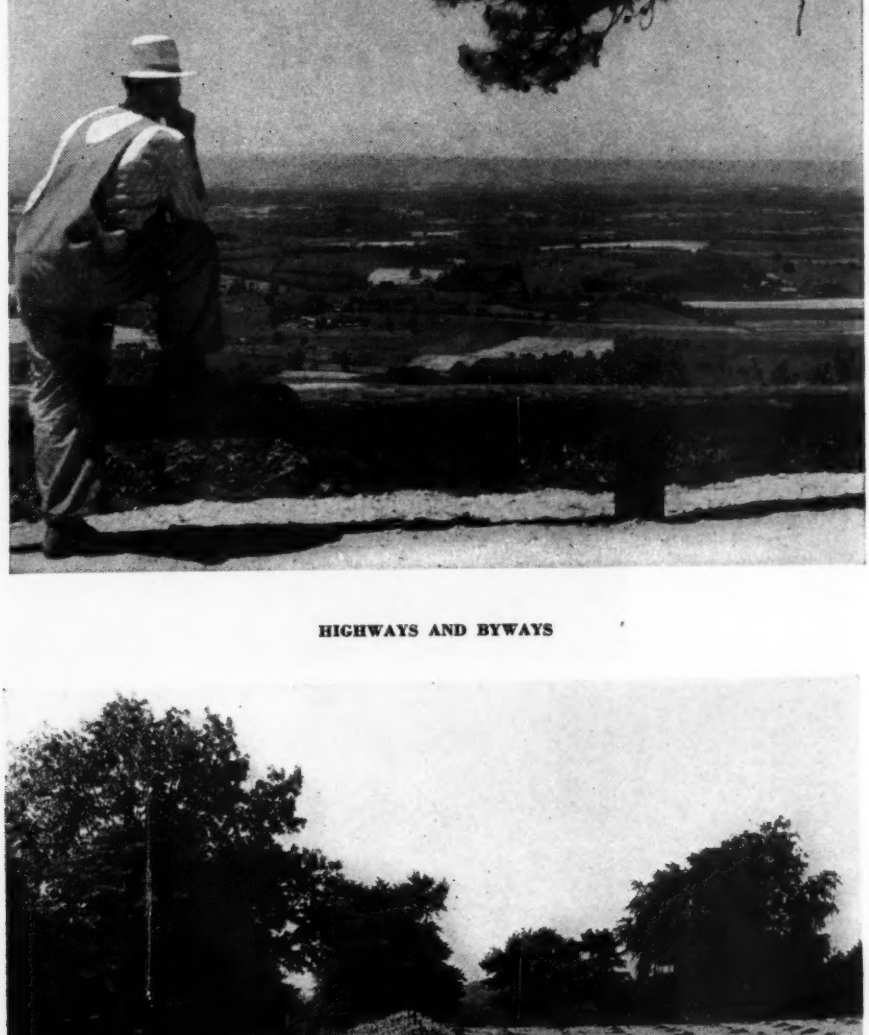


Haying

Harvesting







HIGHWAYS AND BYWAYS

The Editors Talk

Land Fever

Economists in the U. S. Department of Agriculture, Land-Grant Colleges, and financial institutions, all of whom have a deep interest in the American economy, have been issuing warnings on the rapid increase in land values. Having in mind the catastrophe that resulted from the land boom during and following World War I, Secretary of Agriculture Clinton P. Anderson at the suggestion of President Truman called on June 9 a conference of representatives of farm organizations, lending institutions, and government agencies to consider the problem of land inflation. In addressing this meeting Secretary Anderson said:

"To see the problem in its real significance I feel that we must see it in terms of human values, in terms of what it does to farm families, their communities, and the nation as a whole. . . . Basically the picture today is this: Farm land prices have risen every year since the war began, and now as of March 1, our latest report, they are 192 per cent of the prewar prices. . . . Speculators—both farmers and non-farmers—think they see a gambler's chance to make a rapid profit and this helps to bid up prices. Farm income has been high relative to land prices, thus adding to the attractiveness of farm ownership. Young tenant farmers, returning veterans, newly unemployed war workers, and similar groups are anxious to acquire farms now. You frequently hear them making statements such as this, 'I want to start farming now when prices are high rather than wait until they go down to a point where a man can't make anything off a farm.'

"I think those young men should be able to acquire farms and I want to make it absolutely clear that I am in favor of safeguarding credit for such farmers when they can find land at prices which reflect its normal earning value. There's a stage in life where, if a man is going to be a farmer, he should start buying a farm. People continue reaching that age regardless of economic cycles. One of the possible tragedies of the present situation is the disastrous effect which it may have on these young men if we don't help protect them.

"For most farmers the payment for a farm is a lifetime proposition and the most important business transaction in their lives. If they make an unwise purchase they are cutting down their income for years to come. Once the mistake is made, it has far-reaching implications. When farm prices start down, the farmer with a heavy fixed indebtedness is always the first to suffer. The soil suffers too. With the ever-occurring necessity to meet the mortgage payments, farmers tend to mine their land, concentrating on cash crops which deplete the soil."

The over-all financial condition of American farmers is exceptionally good. The demand for their products is high and is likely to remain so for some time to come. Sound investments in land at this time in all probability can be made. The warning is directed at those who are misled by present-day conditions into failing to use good judgment. Before purchasing, prospective buyers could well consult agricultural officials on the soundness of local values. A little care exercised now may prevent tragedy in the future.

Soil or Climate

Remarkable soil characteristics, usually including a great natural fertility, most often are brought to one's attention in the famous crop-producing sections of the various states. In southern Florida, around Homestead, however, is an area in which it would appear that climate is the prevailing factor to the extent that unbelievable measures are taken to provide some base in which the plant can grow so as to take advantage of the excellent climatic conditions. In the strict technical sense of the word there are practically no soils existing in this part of the State, since the geological formations are too young to have evolved into soils. Nevertheless there is here a lot of vegetative growth and a highly developed agricultural industry.

There are two predominant types of material in which the plants are grown and which due to habit and as a matter of convenience are termed soils, to the consternation and dismay of our soil survey authorities. One of these general types of soils consists of a marl deposit on limestone while the other is a soft limestone itself. The marl soil does not appear at first observation to be particularly unusual since it has the appearance of soil, although upon examination it will be found that the material is an almost impalpable powder. Much more striking is the agriculture established on the soft limestone material. In its natural state it is grown up with trees and underbrush which over the course of time have provided a thin layer of organic matter on the surface. The roots were able to push through the soft stone in their search for moisture and plant food and thus establish channels which introduced organic matter into the rock at various depths.

In order to utilize these soils the growth is removed and heavy equipment reminiscent of the machines used in building roads go over the deposit crushing the limestone to a depth of 8-10 inches and leaving what looks like and really is a bed of crushed stone with practically no evidence of any fine soil. Acres and acres of citrus and avocado trees can be observed planted in such material and it is reported that some vegetables are grown as inter-crops. Even more remarkable is the fact that the plants seem to get along very well. Naturally fertilization has to be rather heavy and frequent since there is nothing in the soil to hold material by absorption or supply very much available plant food except calcium.

This is a case where growers are willing to invest up to $300 per acre in preparing the land for planting so as to take advantage of the highly favorable climatic conditions even though there would appear to be no natural soil fertility involved. It is easier to supply soil fertility than climate.

James Benton Grant

1888-1947

Late Chairman of the Board of the Potash Company of America and Charter Member, Board of Directors, American Potash Institute

Season Average Prices Received by Farmers for Specified Commodities *

Crop Year	Cotton Cents per lb.	Tobacco Cents per lb.	Potatoes Cents per bu.	Sweet Potatoes Cents per bu.	Corn Cents per bu.	Wheat Cents per bu.	Hay Dollars per ton	Cottonseed Dollars per ton	Truck Crops
	Aug.-July	.....	July-June	July-June	Oct.-Sept.	July-June	July-June	July-June	....
Av. Aug. 1909–July 1914....	12.4	10.0	69.7	87.8	64.2	88.4	11.87	22.55	....
1920.....	15.9	17.3	125.3	141.7	61.8	182.6	16.46	25.65	....
1921.....	17.0	19.5	113.3	113.1	52.3	103.0	11.63	29.14	....
1922.....	22.9	22.8	65.9	100.4	74.5	96.6	11.64	30.42	....
1923.....	28.7	19.0	92.5	120.6	82.5	92.6	13.08	41.23	....
1924.....	22.9	19.0	68.6	149.6	106.3	124.7	12.66	33.25	....
1925.....	19.6	16.8	170.5	165.1	69.9	143.7	12.77	31.59	....
1926.....	12.5	17.9	131.4	117.4	74.5	121.7	13.24	22.04	....
1927.....	20.2	20.7	101.9	109.0	85.0	119.0	10.29	34.83	....
1928.....	18.0	20.0	53.2	118.0	84.0	99.8	11.22	34.17	....
1929.....	16.8	18.3	131.6	117.1	79.9	103.6	10.90	30.92	....
1930.....	9.5	12.8	91.2	108.1	59.8	67.1	11.06	22.04	....
1931.....	5.7	8.2	46.0	72.6	32.0	39.0	8.69	8.97	....
1932.....	6.5	10.5	38.0	54.2	31.9	38.2	6.20	10.33	....
1933.....	10.2	13.0	82.4	69.4	52.2	74.4	8.09	12.88	....
1934.....	12.4	21.3	44.6	79.8	81.5	84.8	13.20	33.00	....
1935.....	11.1	18.4	59.3	70.3	65.5	83.2	7.52	30.54	....
1936.....	12.4	23.6	114.2	92.9	104.4	102.5	11.20	33.36	....
1937.....	8.4	20.4	52.9	82.0	51.8	96.2	8.74	19.51	....
1938.....	8.6	19.6	55.7	73.0	48.6	56.2	6.78	21.79	....
1939.....	9.1	15.4	69.7	74.9	56.8	69.1	7.94	21.17	....
1940.....	9.9	16.0	54.1	85.5	61.8	68.2	7.58	21.73	....
1941.....	17.0	26.4	80.7	94.0	75.1	94.5	9.67	47.65	....
1942.....	19.0	36.9	117.0	119.0	91.7	109.8	10.80	45.61	....
1943.....	19.9	40.5	131.0	204.0	112.0	136.0	14.80	52.10	....
1944.....	20.7	42.0	149.0	192.0	109.0	141.0	16.40	52.70	....
1945.....	22.4	42.6	139.0	200.0	114.0	149.0	15.10	51.80	....
1946									
May.....	24.09	43.0	157.0	251.0	135.0	170.0	14.80	49.60	....
June.....	25.98	59.0	147.0	251.0	142.0	174.0	14.70	51.50	....
July.....	30.83	56.7	148.0	275.0	196.0	187.0	15.00	60.00	....
August.....	33.55	48.6	143.0	280.0	180.0	178.0	15.10	59.10	....
September...	35.30	48.8	128.0	224.0	173.0	179.0	15.40	57.80	....
October.....	37.69	53.0	122.0	209.0	171.0	188.0	16.10	66.00	....
November....	29.23	43.8	123.0	200.0	127.0	189.0	17.20	89.90	....
December....	29.98	43.5	126.0	210.0	122.0	192.0	17.70	91.50	....
1947									
January.....	29.74	39.0	129.0	220.0	121.0	191.0	17.50	90.40	....
February.....	30.56	31.9	131.0	228.0	123.0	199.0	17.50	88.20	....
March.....	31.89	33.6	139.0	235.0	150.0	244.0	17.40	88.00	....
April.....	32.26	30.1	147.0	233.0	163.0	240.0	17.20	88.00	....
Index Numbers (Aug. 1909—July 1914 = 100)									
1920.....	128	173	180	161	96	207	139	114	....
1921.....	137	195	163	129	81	117	98	129	....
1922.....	185	228	95	114	116	109	98	135	....
1923.....	231	190	133	137	129	105	110	183	....
1924.....	185	190	98	170	166	141	107	147	143
1925.....	158	168	245	188	109	163	108	140	143
1926.....	101	179	189	134	116	138	112	98	139
1927.....	163	207	146	124	132	135	87	154	127
1928.....	145	200	76	134	131	113	95	152	154
1929.....	135	183	189	133	124	117	92	137	137
1930.....	77	128	131	123	93	76	93	98	129
1931.....	46	82	66	83	50	44	73	40	115
1932.....	52	105	55	62	50	43	52	46	102
1933.....	82	130	118	79	81	84	68	57	91
1934.....	100	213	64	91	127	96	111	146	95
1935.....	90	184	85	80	102	94	63	135	119
1936.....	100	236	164	106	163	116	94	148	104
1937.....	68	204	76	93	81	109	74	87	110
1938.....	69	196	80	83	76	64	57	97	88
1939.....	73	154	100	85	88	78	67	94	91
1940.....	80	160	78	97	96	77	64	98	111
1941.....	137	264	116	107	117	107	81	211	129
1942.....	153	369	168	136	143	124	91	202	163
1943.....	160	405	188	232	174	154	125	231	245
1944.....	167	420	214	219	170	160	138	234	212
1945.....	181	435	199	228	178	169	127	230	224
1946									
May.....	194	430	225	286	210	192	125	220	177
June.....	210	590	211	286	221	197	124	228	185
July.....	249	567	212	313	305	212	126	266	163
August.....	287	486	205	319	280	201	127	262	162
September...	285	488	184	255	269	202	130	256	154
October.....	304	530	175	238	266	213	136	293	151
November....	236	438	176	228	198	214	145	399	207
December....	242	435	181	239	190	217	149	406	166
1947									
January.....	240	390	185	351	188	216	147	401	238
February.....	246	319	188	260	192	225	147	391	275
March.....	257	336	199	268	234	276	147	390	299
April.....	260	301	211	265	254	271	145	390	295

Wholesale Prices of Ammoniates

	Nitrate of soda per unit N bulk	Sulphate of ammonia bulk per unit N	Cottonseed meal S. E. Mills per unit N	Fish scrap, dried 11–12% ammonia, 15% bone phosphate, f.o.b. factory, bulk per unit N	Tankage 11% ammonia, 15% bone phosphate, f.o.b. Chicago, bulk, per unit N	High grade ground blood, 16–17% ammonia, Chicago, bulk, per unit N
1910–14	$2.68	$2.85	$3.50	$3.53	$3.37	$3.52
1922	3.04	2.58	6.07	4.66	4.75	4.99
1923	3.02	2.90	6.19	4.83	4.59	5.16
1924	2.99	2.44	5.87	5.02	3.60	4.25
1925	3.11	2.47	5.41	5.34	3.97	4.75
1926	3.06	2.41	4.40	4.95	4.36	4.90
1927	3.01	2.26	5.07	5.87	4.32	5.70
1928	2.67	2.30	7.06	6.63	4.92	6.00
1929	2.57	2.04	5.64	5.00	4.61	5.72
1930	2.47	1.81	4.78	4.96	3.79	4.58
1931	2.34	1.46	3.10	3.95	2.11	2.46
1932	1.87	1.04	2.18	2.18	1.21	1.36
1933	1.52	1.12	2.95	2.86	2.06	2.46
1934	1.52	1.20	4.46	3.15	2.67	3.27
1935	1.47	1.15	4.59	3.10	3.06	3.65
1936	1.53	1.23	4.17	3.42	3.58	4.25
1937	1.63	1.32	4.91	4.66	4.04	4.80
1938	1.69	1.38	3.69	3.76	3.15	3.53
1939	1.69	1.35	4.02	4.41	3.87	3.90
1940	1.69	1.36	4.64	4.36	3.33	3.39
1941	1.69	1.41	5.50	5.32	3.76	4.43
1942	1.74	1.41	6.11	5.77	5.04	6.76
1943	1.75	1.42	6.30	5.77	4.86	6.62
1944	1.75	1.42	7.68	5.77	4.86	6.71
1945	1.75	1.42	7.81	5.77	4.86	6.71
1946						
May	1.75	1.42	9.08	6.10	4.86	7.30
June	1.88	1.42	10.34	6.42	4.86	7.90
July	1.88	1.42	11.62	8.15	5.34	9.60
August	2.22	1.46	16.88	8.14	6.07	12.14
September	2.22	1.46	10.32	6.95	6.07	12.14
October	2.22	1.46	13.20	7.12	8.30	12.14
November	2.22	1.46	15.19	11.26	12.14	12.75
December	2.22	1.46	14.63	11.37	12.14	11.17
1947						
January	2.36	1.46	12.98	11.06	12.14	10.32
February	2.41	1.46	10.01	11.06	12.14	10.17
March	2.41	1.46	11.98	11.06	12.50	10.50
April	2.41	1.51	11.72	10.79	12.75	11.39
Index Numbers (1910-14 = 100)						
1922	113	90	173	132	140	142
1923	112	102	177	137	136	147
1924	111	86	168	142	107	121
1925	115	87	155	151	117	135
1926	113	84	126	140	129	139
1927	112	79	145	166	128	162
1928	100	81	202	188	146	170
1929	96	72	161	142	137	162
1930	92	64	137	141	12	130
1931	88	51	89	112	63	70
1932	71	36	62	62	36	39
1933	59	39	84	81	97	71
1934	59	42	127	89	79	93
1935	57	40	131	88	91	104
1936	59	43	119	97	106	131
1937	61	46	140	132	120	122
1938	63	48	105	106	93	100
1939	63	47	115	125	115	111
1940	63	48	133	124	99	96
1941	63	49	157	151	112	126
1942	65	49	175	163	150	192
1943	65	50	180	163	144	189
1944	65	50	219	163	144	191
1945	65	50	223	163	144	191
1946						
May	65	50	259	173	144	207
June	70	50	295	182	144	224
July	70	50	332	231	158	273
August	83	51	482	231	180	345
September	83	51	295	197	180	345
October	83	51	377	202	246	345
November	83	51	434	319	360	362
December	83	51	418	322	360	317
1947						
January	88	51	371	313	360	293
February	90	51	286	313	360	289
March	90	51	342	313	371	298
April	90	53	335	306	378	324

Wholesale Prices of Phosphates and Potash **

	Superphosphate Baltimore, per unit	Florida land pebble 68% f.o.b. mines, bulk, per ton	Tennessee phosphate rock, 75% f.o.b. mines, bulk, per ton	Muriate of potash bulk, per unit, c.i.f. Atlantic and Gulf ports	Sulphate of potash in bags, per unit, c.i.f. Atlantic and Gulf ports	Sulphate of potash magnesia, per ton, c.i.f. Atlantic and Gulf ports	Manure salts bulk, per unit, c.i.f. Atlantic and Gulf ports[1]
1910–14	$0.536	$3.61	$4.88	$0.714	$0.953	$24.18	$0.657
1922	.566	3.12	6.90	.632	.904	23.87	....
1923	.550	3.08	7.50	.588	.836	23.32	....
1924	.502	2.31	6.60	.582	.860	23.72	....
1925	.600	2.44	6.16	.584	.860	23.72	..
1926	.598	3.20	5.57	.596	.854	23.58	.537
1927	.525	3.09	5.50	.646	.924	25.55	.586
1928	.580	3.12	5.50	.669	.957	26.46	.607
1929	.609	3.18	5.50	.672	.962	26.59	.610
1930	.542	3.18	5.50	.681	.973	26.92	.618
1931	.485	3.18	5.50	.681	.973	26.92	.618
1932	.458	3.18	5.50	.681	.963	26.90	.618
1933	.434	3.11	5.50	.662	.864	25.10	.601
1934	.487	3.14	5.67	.486	.751	22.49	.483
1935	.492	3.30	5.69	.415	.684	21.44	.444
1936	.476	1.85	5.50	.464	.708	22.94	.505
1937	.510	1.85	5.50	.508	.757	24.70	.556
1938	.492	1.85	5.50	.523	.774	15.17	.572
1939	.478	1.90	5.50	.521	.751	24.52	.570
1940	.516	1.90	5.50	.517	.730	24.75	.573
1941	.547	1.94	5.64	.522	.780	25.55	.570
1942	.600	2.13	6.29	.522	.810	25.74	.205
1943	.631	2.00	5.93	.522	.786	25.35	.195
1944	.645	2.10	6.10	.522	.777	25.35	.195
1945	.650	2.20	6.23	.522	.777	25.35	.195
1946							
May	.650	2.20	6.40	.535	.797	26.00	.200
June	.650	2.30	6.45	.471	.729	22.88	.176
July	.650	2.60	6.60	.471	.729	22.88	.176
August	.700	2.60	6.60	.471	.729	22.88	.176
September	.700	2.60	6.60	.471	.729	22.88	.176
October	.700	2.60	6.60	.471	.729	22.88	.176
November	.700	2.60	6.60	.535	.797	26.00	.200
December	.700	2.60	6.60	.535	.797	26.00	.200
1947							
January	.700	2.60	6.60	.535	.797	26.00	.200
February	.720	2.60	6.60	.535	.799	26.00	.200
March	.740	2.75	6.60	.535	.797	26.00	.200
April	.740	2.97	6.60	.535	.797	26.00	.200
	Index Numbers (1910-14 = 100)						
1922	106	87	141	89	95	99	....
1923	103	85	154	82	88	96	....
1924	94	64	135	82	90	98	....
1925	110	68	126	82	90	98	....
1926	112	88	114	83	90	98	82
1927	100	86	113	90	97	106	89
1928	108	86	113	94	100	109	92
1929	114	88	113	94	101	110	93
1930	101	88	113	95	102	111	94
1931	90	88	113	95	102	111	94
1932	85	88	113	95	101	111	94
1933	81	86	113	93	91	104	91
1934	91	87	110	68	79	93	74
1935	92	91	117	58	72	89	68
1936	89	51	113	65	74	95	77
1937	95	51	113	71	79	102	85
1938	92	51	113	73	81	104	87
1939	89	53	113	73	79	101	87
1940	96	53	113	72	77	102	87
1941	102	54	110	73	82	106	87
1942	112	59	129	73	85	106	84
1943	117	55	121	73	82	105	83
1944	120	58	125	73	82	105	83
1945	121	61	128	73	82	105	83
1946							
May	121	61	131	75	84	108	83
June	121	64	132	66	76	95	80
July	121	72	135	66	76	95	80
August	131	72	135	66	76	95	80
September	131	72	135	66	76	95	80
October	131	72	135	66	76	95	80
November	131	72	135	75	84	108	83
December	131	72	135	75	84	108	83
1947							
January	131	72	135	75	84	108	83
February	134	72	135	75	84	108	83
March	138	76	135	75	84	108	83
April	138	82	135	75	84	108	83

Combined Index Numbers of Prices of Fertilizer Materials, Farm Products and All Commodities

	Farm prices*	Prices paid by farmers for commodities bought*	Wholesale prices of all commodities†	Fertilizer material‡	Chemical ammoniates	Organic ammoniates	Superphosphate	Potash**
1922	132	149	141	116	101	145	106	85
1923	143	152	147	114	107	144	103	79
1924	143	152	143	103	97	125	94	79
1925	156	156	151	112	100	131	109	80
1926	146	155	146	119	94	135	112	86
1927	142	153	139	116	89	150	100	94
1928	151	155	141	121	87	177	108	97
1929	149	154	139	114	79	146	114	97
1930	128	146	126	105	72	131	101	99
1931	90	126	107	83	62	83	90	99
1932	68	108	95	71	46	48	85	99
1933	72	108	96	70	45	71	81	95
1934	90	122	109	72	47	90	91	72
1935	109	125	117	70	45	97	92	63
1936	114	124	118	73	47	107	89	69
1937	122	131	126	81	50	129	95	75
1938	97	123	115	78	52	101	92	77
1939	95	121	112	79	51	119	89	77
1940	100	122	115	80	52	114	96	77
1941	124	131	127	86	56	130	102	77
1942	159	152	144	93	57	161	112	77
1943	192	167	151	94	57	160	117	77
1944	195	176	152	96	57	174	120	76
1945	202	180	154	97	57	175	121	76
1946								
May	211	192	162	99	57	189	121	76
June	218	196	163	100	60	203	121	70
July	244	209	181	103	60	230	121	70
August	249	214	187	116	67	293	131	70
September	243	210	181	108	67	223	131	70
October	273	218	197	115	67	286	131	70
November	263	224	198	127	67	382	131	78
December	264	225	204	127	67	376	131	78
1947								
January	260	227	206	126	69	359	131	78
February	262	234	209	124	70	329	134	78
March	280	240	216	128	70	354	138	78
April	276	243	215	129	71	354	138	78

* U. S. D. A. figures. Beginning January 1946 farm prices and index numbers of specific farm products revised from a calendar year to a crop-year basis. Truck crops index adjusted to the 1924 level of the all-commodity index.

† Department of Labor index converted to 1910-14 base.

‡ The Index numbers of prices of fertilizer materials are based on original study made by the Department of Agricultural Economics and Farm Management Cornell University, Ithaca, New York. These indexes are complete since 1897. The series was revised and reweighted as of March 1940 and November 1942.

[1] Since June 1941, manure salts are quoted F.O.B. mines exclusively.

**** The weighted average of prices actually paid for potash are lower than the annual average because since 1926 over 90% of the potash used in agriculture has been contracted for during the discount period. Since 1937, the maximum discount has been 12%. Applied to muriate of potash, a price slightly above $.471 per unit K_2O thus more nearly approximates the annual average than do prices based on arithmetical averages of monthly quotations.**

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture, the State Experiment Stations, and Canada, relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

"Ninth Annual Report of the Arizona Fertilizer Control Office, Year ending December 31, 1946," Agr. Exp. Sta., Univ. of Ariz., Tucson, Ariz., Feb. 1947.

"Fertilizers, Soil Analysis, and Plant Nutrition," Agr. Exp. Sta., Univ. of Calif., Berkeley, Calif., Cir. 367, March 1947, D. R. Hoagland.

"Supplemental List Commercial Fertilizers Registrants for the Fiscal Year Ending June 30, 1947," Bu. of Chem., Dept. of Agr., Sacramento, Calif., FM-138, March 24, 1947.

"Supplemental List Agricultural Minerals Registrants for the Fiscal Year Ending June 30, 1947," Bu. of Chem., Dept. of Agr., Sacramento, Calif., FM-139, March 24, 1947.

"Fertilizer, Seed, Lime and Ice Cream Report, July-December-1946," State Board of Agr., Dover, Del., Vol. 36, No. 4, Jan. 31, 1947.

"The Significance and Maintenance of Nitrate Nitrogen in Bladen Fine Sandy Loam in the Production of Cabbage," Agr. Exp. Sta., Univ. of Fla., Gainesville, Fla., Bul. 430, March 1947, G. M. Volk, C. E. Bell, and E. N. McCubbin.

"Tonnage of Different Grades of Fertilizer Sold in Michigan in 1946," Soil Science Dept., Mich. State College, East Lansing, Mich.

"Tonnage Summary of Mixed Fertilizers, Fertilizer Materials, and Limes Sold in New Jersey during 1946," Agr. Exp. Sta., New Brunswick, N. J., March 26, 1947, Stacy B. Randle.

"Report of Analyses of Commercial Fertilizers and Lime Materials Sold in New York State, January 1 to December 31, 1945," State Dept. of Agr. and Markets, Albany, N. Y., Bul. 354, March 1946.

Soils

"Conservation of Massachusetts Soils," Ext. Serv., Mass. State College, Amherst, Mass., Leaf. No. 193 (Rev. April 1947), A. B. Beaumont and Karol Kucinski.

"Principal Soil Regions of Minnesota," Agr. Exp. Sta., Univ. of Minn., St. Paul 8, Minn., Bul. 392, March 1947, P. R. McMiller.

"The Southeastern Soil Improvement Station at Heavener: Summary of Results to Date," Agr. Exp. Sta., Okla. A & M, Stillwater, Okla., Mimeo. Cir. M-165, May 1947.

"The Value of Supplemental Irrigation in Willamette Valley," Agr. Exp. Sta., Oreg. State College, Corvallis, Oreg., Sta. Bul. 439, Aug. 1946, W. L. Powers.

"Physical Land Conditions in the Rio Grande Watershed of Southern New Mexico," U.S.D.A., Washington, D. C., Phys. Land Survey 42, 1947.

"Review of Principal Results, Southern Piedmont Experiment Station, 1946," U.S.D.A., Washington, D. C., B. H. Hendrickson, John R. Carreker, and William E. Adams.

Crops

"Cherry Culture in California," Agr. Ext. Serv., Univ. of Calif., Berkeley, Calif., Cir. 46 (Rev. Jan. 1947), Guy L. Philp.

"Bush Berry Culture in California," Agr. Ext. Serv., Univ. of Calif., Berkeley, Calif., Ext. Cir. 80 (Rev. Jan. 1947), H. M. Butterfield.

"Grape Growing in California," Agr. Ext. Serv., Univ. of Calif., Berkeley, Calif., Cir. 116 (Rev. Jan. 1947), H. E. Jacob.

"Twenty-Sixth Annual Report, Period Ending December 31, 1945," Calif. Dept. of Agr., Sacramento, Calif., Vol. XXXIV, No. 4.

"Tree Fruits for Plains and Foothill Regions," Ext. Serv., Colo. A & M, Fort Collins, Colo., Cir. 142-A, Sept. 1946, Chas. M. Drage and George A. Beach.

"Dutch Elm Disease and its Chemotherapy," Conn. Agr. Exp. Sta., New Haven, Conn., Bul. 498, July 1946, George A. Zentmyer, James G. Horsfall, and Philip P. Wallace.

"Field Corn Trials, Mt. Carmel & Windsor, Connecticut, 1946," Conn. Agr. Exp. Sta., New Haven, Conn., Report of Progress 46G1, H. L. Everett, D. F. Jones, and W. R. Singleton.

"Hawaiian-Grown Vegetables," Agr. Exp. Sta., Univ. of Hawaii, Honolulu, T. H., Tech. Bul. No. 5, March 1947, Carey D. Miller, Winifred Ross, and Lucille Louis.

"An Illinois Garden Guide," Agr. Ext. Serv., Univ. of Ill., Urbana, Ill., Cir. 522, 1943 ed. with 1947 supplement.

"Planting Rates and Distances for Sweet

Corn," Agr. Ext. Serv., Univ. of Ill., Urbana, Ill., Cir. 611, Jan. 1947, W. A. Huelsen.

"Indiana Soybean Variety Tests and Variety Recommendations," Agr. Exp. Sta., Purdue Univ., Lafayette, Ind., Cir. 322, 1947, A. H. Probst and G. H. Cutler.

"The Lawn, Its Making and Maintenance," Dept. of Agr. Ext., Purdue Univ., Lafayette, Ind., Ext. Bul. 254 (2nd Rev.), 1947.

"The 1946 Iowa Corn Yield Test," Agr. Exp. Sta., Iowa State College, Ames, Iowa, Bul. P 84, Feb. 1947, Charles D. Hutchcroft, Joe L. Robinson, and Francis Reiss.

"Thirteenth Biennial Report of the Director, for the Biennium July 1, 1944 to June 30, 1946," Agr. Exp. Sta., Kansas State College, Manhattan, Kansas.

"Soil Conservation in Kansas," State Board of Agr., Topeka, Kansas, Vol. LXV, No. 271, Feb. 1946.

"A Handbook of Agronomy for Professional Workers and Farm Leaders in Louisiana," Div. of Agr. Ext., La. State Univ., Baton Rouge 3, La., Ext. Bul. 6, Nov. 1946, R. A. Wasson.

"Weather and Water as Factors in Cranberry Production," Agr. Exp. Sta., Mass. State College, Amherst, Mass., Bul. 433, June 1946, Henry J. Franklin and Neil E. Stevens.

"Pot Plant Pointers," Ext. Serv., Mich. State College, East Lansing, Mich., Ext. Folder 108 (2nd Printing), March 1947, Paul R. Krone.

"Growing Garden Flowers From Seed," N. Y. State College of Agr., Cornell Univ., Ithaca, N. Y., Ext. Bul. 579, March 1943 (Rev. Jan. 1947), R. C. Allen.

"Factors Affecting the Acid and Total Solids Content of Tomatoes," N. Y. State Agr. Exp. Sta., Cornell Univ., Geneva, N. Y., Tech. Bul. 278, Oct. 1946, Frank A. Lee and Charles B. Sayre.

"Profitable Soybean Yields," N. C. Agr. Ext. Serv., State College Station, Raleigh, N. C., Ext. Cir. 295, Jan. 1947, E. R. Collins, W. L. Nelson, and E. E. Hartwig.

"Five Steps to Increase Corn Yields," N. C. Agr. Ext. Serv., State College Station, Raleigh, N. C., Ext. Cir. 296, March 1947, E. R. Collins and B. A. Krantz.

"Performance Tests of Corn Varieties and Hybrids, 1946," Agr. Exp. Sta., Okla. A & M, Stillwater, Okla., Bul. B-306, March 1947, James S. Brooks and Roy A. Chessmore.

"Irish Potato Variety and Fertilization Trials at the Southeastern Soil Improvement Station, Heavener," Agr. Exp. Sta., Okla. A & M, Stillwater, Okla.

"Sugar Beet Seed Production in Oregon," Agr. Exp. Sta., Oreg. State College, Corvallis, Oreg., Sta. Bul. 437, June 1946, Ray A. Pendleton, H. E. Finnell, and F. C. Reimer.

"A Method of Topworking Pear Trees for Early Maximum Production and for Reducing Stony Pit Losses," Agr. Exp. Sta., Oreg. State College, Corvallis, Oreg., Sta. Bul. 438, June 1946, Gordon G. Brown.

"Culture of Trailing Berries in Oregon," Agr. Exp. Sta., Oreg. State College, Corvallis, Oreg., Sta. Bul. 441, Dec. 1946, G. F. Waldo and Henry Hartman.

"Strawberry Production in Oregon," Agr. Exp. Sta., Oreg. State College, Corvallis, Oreg., Sta. Bul. 442, Feb. 1947, G. F. Waldo and Henry Hartman.

"Raspberry Culture in Oregon," Agr. Exp. Sta., Oreg. State College, Corvallis, Oreg., Sta. Bul. 443, Feb. 1947, G. F. Waldo and Henry Hartman.

"The Cheatgrass Problem in Oregon," Ext. Serv., Oreg. State College, Corvallis, Oreg., Ext. Bul. 668, June 1946, Kenneth Platt and E. R. Jackman.

"The Orient Pear," Agr. Exp. Sta., Univ. of Tenn., Knoxville, Tenn., Cir. 95, Nov. 1946, Brooks D. Drain.

"Pastures Improved with Tillage-Treatment-Seed," W. Va. Agr. Exp. Sta., Morgantown, W. Va., Bul. 327, Jan. 1947, R. M. Smith, G. G. Pohlman, F. W. Schaller, and D. R. Browning.

"Serves State & Nation," Ext. Serv., College of Agr., Univ. of Wis., Madison, Wis., Cir. 370, July 1946.

"The Vegetable Garden," Ext. Serv., College of Agr., Univ. of Wis., Madison, Wis., Cir. 372, Jan. 1947, O. B. Combs.

"Wisconsin Needs Better Pastures," Ext. Serv., College of Agr., Univ. of Wis., Madison, Wis., Cir. 373, Jan. 1947, F. V. Burcalow, L. F. Graber, and H. L. Ahlgren.

"Report of the Administrator of Agricultural Research, 1946," Agr. Research Admin., U.S.D.A., Washington, D. C.

"Report of the Chief of the Office of Experiment Stations, Agricultural Research Admin., 1946," U.S.D.A., Washington, D. C.

Economics

"Tomato Plant Growing Management Study in Sacramento County during 1944," Agr. Ext. Serv., Univ. of Calif., Berkeley, Calif., J. E. Spurlock, B. B. Burlingame, and P. A. Minges.

"Ventura County Citrus Orchard Management Study, Valencia Oranges and Lemons, 1945," Agr. Ext. Serv., Univ. of Calif., Berkeley, Calif., Arthur Shultis, and Calvin C. Delphey.

"Cost of Production Study on Almonds, Stanislaus County, 1945," Agr. Ext. Serv., Univ. of Calif., Berkeley, Calif.

"Second Annual Pasture Management Cost Study, San Joaquin County, 1945," Agr. Ext. Serv., Univ. of Calif., Berkeley, Calif., B. B. Burlingame and Dan L. Dieter.

"1946 Sugar Beet Production Cost Analysis, Imperial County," Agr. Ext. Serv., Univ. of Calif., Berkeley, Calif.

"1945 Lemon Management Study, Los Angeles County," Agr. Ext. Serv., Univ. of Calif., Berkeley, Calif.

"1945 Navel Orange Management Study,

Los Angeles County," Agr. Ext. Serv., Univ. of Calif., Berkeley, Calif.

"1945 Valencia Orange Management Study, Los Angeles County," Agr. Ext. Serv., Univ. of Calif., Berkeley, Calif.

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"Canadian Agricultural Program for 1947," Agr. Supplies Board, Dom. Dept. of Agr., Ottawa, Canada.

"Farm Family Living in the Prairie Provinces," Marketing Serv., Economics Div., Dom. Dept. of Agr., Ottawa, Canada, Publ. 787, March 1947, Florence M. Edwards.

"Connecticut Vegetable Industry and its Outlook for 1947," Bu. of Markets, Dept. of Agr., Hartford, Conn., Bul. 96, April 1947.

"1946 Statistics of Diversified Agriculture in Hawaii," Agr. Ext. Serv., Univ. of Hawaii, Honolulu 10, T. H., Ext. Cir. 217, March 1947.

"Study Your Own Farm Work Methods," Agr. Exp. Sta., Purdue Univ., Lafayette, Ind., Sta. Cir. 307, 1947, Lowell S. Hardin.

"Farming Today for Young Men and Women," Agr. Exp. Sta., Iowa State College, Ames, Iowa, Bul. P 82, Dec. 1946.

"Roughage Makes Milk Profits," Agr. Exp. Sta., Rutgers Univ., New Brunswick, N. J., Cir. 505, Feb. 1947, John W. Carncross and Joseph F. Hauck.

"New York Agricultural Outlook, 1947," N. Y. State College of Agr., Cornell Univ., Ithaca, N. Y., Ext. Bul. 706, Jan. 1947.

"A Guide to Better Dairying," Agr. Ext. Serv., Univ. of N. C., Raleigh, N. C., Ext. Cir. 294, Jan. 1947.

"Measured Crop Performance, 1946," Agr. Exp. Sta., Univ. of N. C., Raleigh, N. C., Bul. 359, Jan. 1947.

"Change in Size of Farms in Ohio—1900-1940," Ohio Agr. Exp. Sta., Wooster, Ohio, Bul. 669, Jan. 1947, J. H. Sitterley and J. I. Falconer.

"An Analysis of Oregon Agriculture," Agr. Exp. Sta., Oreg. State College, Corvallis, Oreg., 1946.

"The Agricultural Outlook, South Carolina, 1947," Clemson Agr. College, Clemson, S. C., Cir. 294, Dec. 1946.

"Washington Apple Production Costs for the 1944-45 Season," Agr. Exp. Sta., State College of Wash., Pullman, Wash., Bul. 474, June 1946, W. M. Bristol.

"Income from Apples in the Eastern Panhandle," Agr. Exp. Sta., W. Va. Univ., Morgantown, W. Va., Bul. 328, Jan. 1947, M. A. Abrahamsen.

"Wisconsin Farm Labor Program," Ext. Serv., College of Agr., Univ. of Wis., Madison, Wis., Cir. 371, March 1947.

"The One-Two-Three to Better Yields and Profits," Production and Marketing Admin., U.S.D.A., Washington, D. C., PA-21, Sept. 1946.

"The Farm Real Estate Situation, 1945-46," Bu. of Agr. Economics, U.S.D.A., Washington, D. C., Cir. 754, Dec. 1946, M. M. Regan and A. R. Johnson.

"Longterm Outlook for Western Agriculture," Bu. of Agr. Economics, U.S.D.A., Washington, D. C., June 1946, Marion Clawson and Wendell Calhoun.

Stepping-Up Corn Yields

Last year 98 per cent of Indiana's 2,169 Five-Acre Corn club members whose yields were checked in 84 counties used fertilizer on their corn, according to reports released today by Purdue University agronomists. This compares with the 60 per cent who were fertilizing corn ten years ago.

Eighty-two per cent of the growers applied all the fertilizer in the row or hill with a fertilizer attachment on the corn planter. Fourteen per cent of the growers plowed under fertilizer, most of whom also used a starter fertilizer. A very small number broadcast the fertilizer.

More fertilizer is being applied in the row at planting than ever before. Twenty-nine per cent of the growers used between 150 and 200 pounds per acre in the row in 1946, while six years ago only six per cent used more than 150 pounds. Only one-third of the growers used 100 pounds or less per acre in the hill last year while this was the common practice a few years back.

The fertilizer practices reported by the best Indiana growers conform closely with Purdue experimental results. In a fertilizer experiment conducted at Lafayette for seven years it was found that fertilizer was most efficient when applied in bands by the hill. Fertilizer dropped in the hill is more effective than when drilled in the row either on

drilled or checked corn with modern equipment. Drilled corn is more responsive to fertilizer drilled in the row than is checked corn, but in either case more fertilizer is required to give the same yield increase than when the fertilizer is hill-dropped. Broadcasting the fertilizer on the surface was the least efficient method of application. Later experiments have shown that larger fertilizer applications than 150 pounds in the hill or 250 pounds in the row, should be plowed under or placed in bands on the "plow sole." Fertilizer for plowing under should be high in nitrogen on upland soils.

Corn responds to both phosphate and potash, in row fertilization, and except on well manured land an analysis such as 0-12-12 is recommended. The use of the quick soil test for available phosphate and potash is a helpful guide to the proper fertilizer analysis to use for corn.

Profitable Soybean Yields in North Carolina

(*From page* 10)

grower is to lime his soil according to its requirement and fertilize his soybeans every year. An exception to this is with soybeans grown after Irish potatoes or some other heavily fertilized truck crop. In this case the supply of phosphorus and potash in the soil is sufficient to take care of the soybean needs.

Proper Placement of Fertilizer Important

A word of caution should be given here in regard to the proper placement of the fertilizer. Soybean seeds are easily injured by the soluble salts in the fertilizer and poor stands may result if the fertilizer is placed in contact with or too near the seed. The fertilizer should be placed in bands to the side and slightly below the level of the seed. Many farmers have suitable combination distributors and planters. If this equipment is not available, mix the fertilizer thoroughly with the soil in the row and bed before planting.

Recommendations

In summary, the recommendations for profitable production of soybeans are as follows:

1. Apply dolomitic limestone to the soil in accordance with its requirements as shown by soil tests. Too much lime makes manganese and some of the minor elements in the soil less available and deficiencies may result, particularly in soils high in organic matter.

2. Fertilize with 400 pounds per acre of 0-10-20 or its equivalent at planting. Place the fertilizer so that it does not injure the seed. An exception is after Irish potatoes or other heavily fertilized truck crops in which case the supply of phosphorus and potash in the soil is usually sufficient to take care of the soybean needs.

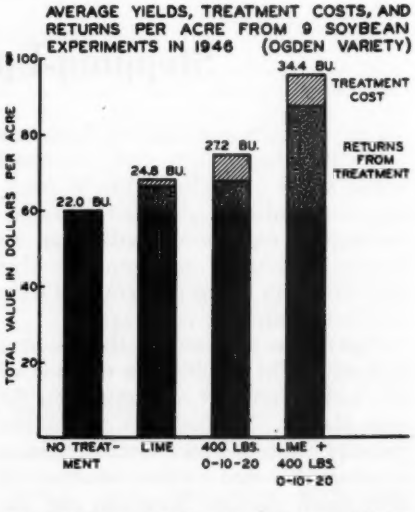

Fig. 6. Returns in dollars from average yields in nine soybean experiments. Soybeans were valued at $2.75 per bushel. Treatment cost includes cost of phosphate and potash applied plus $1.20 per acre for the lime application.

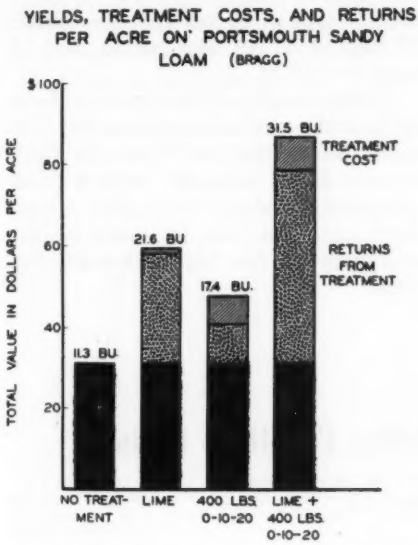

Fig. 7. With no treatment, the yield was near the State average, yet the net return from lime and fertilizer was $47.35 per acre.

3. Plant recommended varieties of soybeans at the rate of 10 to 12 seeds per foot of row or approximately one bushel per acre. In North Carolina, Ogden and Roanoke are suggested. The Roanoke variety does well in the Upper Coastal Plain and in the Piedmont. Good stands of vigorous plants greatly aid in controlling weeds.

1947 County Soybean Demonstrations

An active extension program under the supervision of Dr. E. R. Collins, in charge of Agronomy Extension, is under way to make the 10- to 12-bushel State average a thing of the past. In 1947 each County Agricultural Agent in the Coastal Plain area and some in the Piedmont will have at least one demonstration acre putting the best production practices known into use. The yield of this acre will be compared with that obtained by the farmer's usual practice.

The Wheelocks of Vermont Grow Grass

(*From page* 12)

are today. Grass is an easy crop to grow. In fact, some years when we have exceptionally wet springs, other farmers are planting corn for silage when we are filling our silos with grass ensilage. We also have a good sod to work on. This is mighty good footing compared to wet, plowed land.

"On a grass farm such as ours, we feed our cows a mixture of grasses and legumes and during the winter supplement this with some grain."

The Wheelocks' herd goes on pasture in early April and gets nothing but pasture until late in October. These Vermont farmers are convinced that cows are, by nature, "hay-burners" and say that the cows would rather have the succulent legumes and grasses than grain.

One way for keeping the cows in A-1 condition is to change the herd to new pastures as soon as they drop below a certain point in milk production. The grasslands are so productive that they can be alternated as pasture and hayland. One 13-acre plot in 1946 produced 32,000 pounds of milk in two grazings by 30 cows and then yielded 25 tons of high quality timothy and white clover hay.

The use of the right amounts and the right kinds of plant foods is of top importance in the Wheelock plan of grassland farming. The entire grass acreage is gone over every two years with eight loads of manure per acre. This manure is supplemented with phosphate. In addition to manure, 400 to 500 pounds of 5-15-20 or 8-16-16 are

applied on each acre. The use of superphosphate in the stable gutters has been carried on for more than 20 years.

Father and son agree that potash is their number one need right now and they plan to apply it heavily as soon as they can obtain more fertilizers rich in this plant food. Lime is used at the rate of about a ton an acre every three years. During 1946, they used the following amounts of fertilizer: 32 tons of lime, 5 tons of 60 per cent phosphate, 25 bags of 60 per cent potash, and 15 bags of 5-15-20.

"Mineralized hay" and pastures have reduced the production cost on this Vermont farm so that the Wheelocks' farm account books show that milk is being produced for about two dollars a hundred less than that by many of the dairymen in this big milk-producing area.

Determining New and Better Fertilizer Ratios

(*From page* 26)

of two years), for the purpose of this paper, yields and moisture contents of the corn from similar plots have been summed and averaged (table 1). It is recognized that much information may be lost by averaging, and individual differences are obscured. Despite differences in soil type and management, however, the reoccurrence of certain ratios as the best was rather remarkable. Table 1 presents the data on yield per acre of corn in bushels (based on 15.5 per cent moisture) and the moisture content of the corn at harvest time as affected by the 27 different fertilizer treatments used. The figures on yield and moisture represent an average of 24 plots. Significance levels were run on individual fields but no attempt was made to analyze statistically the six fields as a unit. Rough calculations would indicate, however, that differences in yield of 6.0 bushels and above would be significant, below 4.0 bushels not significant, and between this range in the doubtful class. Similarly, differences in moisture content of two per cent and above are probably significant.

Yield Results

It is apparent that, in general, a complete fertilizer with fairly narrow ratio of nitrogen, phosphate, and potash has given the best response. Phosphate is the predominantly lacking element, because it was necessary in all fertilizers which gave increases of 6.0 bushels and above. Potash and nitrogen, alone, and in combination, did not give significant increases over the check. However, to get balance in the fertilizer with high amounts of phosphate and moderate amounts of nitrogen, potash was necessary, and as a matter of fact, in the top four fertilizers potash was equal in requirement to phosphate.

It would appear from the stand used (3 or 4 stalks per hill), that amounts of plant food of about 130 pounds were sufficient to give maximum yield increases.

Moisture Results

A complete fertilizer, again in general, resulted in greatest moisture reductions, but other fertilizers also lessened moisture in the corn almost as much. The combination of nitrogen and phosphate as in treatments 21 and 20 gave substantial moisture reductions of over three per cent. Nitrogen and potash alone, and in combination, have not hastened the maturity of corn, but on the contrary may have an opposite effect.

TABLE 2. RATINGS OF THE 10 BEST RATIOS USED IN 2-YEAR FERTILIZER TRIALS ON CORN.

Treatment No.	Pounds plant food per acre (applied in hill)			Fertilizer ratio	Relative fertilizer ratings as percentages of:			
	Nitrogen	Phosphate	Potash		The maximum increase in yield (100 = 18.1 bushels)*	The most expensive fertilizer	The greatest net profit	The maximum decrease in moisture (100 = 4.5%)
26....	32	32	64	1–1–2	97	78	100	81
25....	32	64	32	1–2–1	100	89	99	97
27....	32	64	64	1–2–2	97	100	87	100
17....	16	32	64	1–2–4	79	59	85	73
16....	16	64	32	1–4–2	81	72	80	76
18....	16	64	64	1–4–4	83	83	76	82
24....	32	32	32	1–1–1	75	67	73	65
15....	16	32	32	1–2–2	66	50	71	60
9....	0	64	64	0–1–1	69	66	65	75
7....	0	64	32	0–2–1	61	55	60	61

* Explanatory note: The best treatment, No. 25, gave an increase over the check of 18.1 bushels, and this was rated as a 100 per cent increase. Plot 18, for example, gave an increase of 15.0 bushels, 83 per cent of 18.1, hence has the rating of 83. The percentage figures in the other columns were derived similarly.

Ratings of the Ten Best Ratios

In table 2 a somewhat new approach has been attempted in rating the 10 best fertilizer ratios as determined by 2-year trials. In this table, the ratios are rated according to their effect on yield increase, moisture decrease, cost, and the greatest net return. The ratings are based on the best or cheapest fertilizer rating 100, and the others rank on down according to their increase in yield or decrease in moisture compared to that obtained from the best fertilizer application.

No figures for fertilizer cost and net profit have been given in the table because relative ratings of fertilizer cost were based on manufacturers' costs and these figures would give an erroneous idea of the probable actual profits from the fertilizer application.

Except for 1-1-1, the narrower ratios have proven to be the best in the trials. Ratios like 1-1-2, 1-2-1, and 1-2-2 run very close in yield and net profit. The 1-2-2 ratio would rank even higher in value due to decreased moisture content if commercial drying of field corn ever became practical. The fertilizers which have returned the greatest net profit have, in general and fortunatelv, been the most efficient in hastening maturity.

An examination of the table shows that the ratios of some of the commonly used fertilizers for corn do not rank particularly high. A fertilizer such as 3-12-12, which has a 1-4-4 ratio, ranks fourth in increasing yields but only sixth in profitableness. Fertilizers with no nitrogen, such as 0-20-20 and 0-20-10, which have ratios of 0-1-1 and 0-2-1, respectively, are down at the bottom of the list in both ability to increase yields and return profits. It is apparent from the facts shown that nitrogen should make up a greater percentage of fertilizers used for corn in this region. The ratio of phosphate to potash, 2 to 1, or 1 to 1, has been quite good, on the basis of the data in the table, but complete utilization was retarded by a lack of nitrogen.

Plot Set-up Applicable to Other Crops

The plot design used above is equally applicable to the determination of ratios for crops like wheat, oats, barley, alfalfa, in fact almost any crop. In Minnesota the past year, the same plot set-up was used in obtaining fer-

tilizer ratio information for flax, wheat, oats, and corn.

More up-to-date information on fertilizer ratios for crops and soils should be of primary interest to fertilizer companies and could be used as a basis for formulating new and better fertilizers. It would appear to be largely the responsibility of the experiment stations to provide this information.

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1. Fisher, R. A. *The design of experiments.* Oliver and Boyd, London. 1937.
2. Yates, F. *The design and analysis of factorial experiments.* Imp. Bur. Soil Sci. Tech. Comm. 35, 1937.

Community Cooperation in Soil Conservation

(*From page* 18)

pervisors for help in getting the same program on his own land. After the farm plan was completed, he hired the tenant, who had been working the farm on a share-crop basis for years, on a monthly salary to apply the soil conservation practices. And the owner went a step further. He tore down some of the unsightly outhouses around the place and gave the barn and the tenant house a new coat of paint.

Supervisors of the Broad River, Greenville, and Laurens Soil Conservation Districts don't claim that they've found a royal road to soil conservation farming. But they know they are on the right road when they encourage groups of farmers to choose their own leaders and work together.

Fig. 5. One group of negro farmers entered the soil conservation contest sponsored by the Spartanburg Herald-Journal and district supervisors and patterned after the work of groups of farmers in Hopewell.

Higher Corn Yields for Alabama

(*From page* 24)

The second highest yield reported in Walker County was 83 bushels per acre of Funk's hybrid 714 produced by W. R. Taylor. He used 500 pounds of 6-8-4 fertilizer at planting and side-dressed with 200 pounds of ammonium nitrate.

R. E. Thagard, Crenshaw County farmer, produced 62.7 bushels of Indian Chief corn, 61.8 bushels of Whatley, 76.6 bushels of Funk's hybrid 714, and 78.4 bushels of L. S. U. hybrid per acre by fertilizing with 300 pounds of 20 per cent superphosphate, 100 pounds of muriate of potash, and by side-dressing with 300 pounds of ammonium nitrate.

Five Coosa County farmers conducting special corn demonstration projects produced from 63.9 bushels to 77.73 bushels per acre. The demonstrators were A. L. Neighbors, J. M. Cochran, J. M. Sellers, and Gerald Ward. They used heavy applications of fertilizer and side-dressed the corn with ammonium nitrate or nitrate of soda.

Lee Jones, UTD farmer of Rt. 1, Roanoke, Randolph County, planted two acres each of Funk's G-714 hybrid and Mosby open-pollinated corn, fertilized with 400 pounds of 4-10-7 and side-dressed with 250 pounds of nitrate of soda. His hybrid corn made 60.4 bushels per acre and Mosby averaged 48.9 bushels.

Robert Iverson, 14-year-old club boy of Graham in Randolph County, taught his father how to grow more corn per acre. He grew 59 bushels per acre by applying 400 pounds of 4-10-7 under the corn and side-dressing with 250 pounds of nitrate of soda.

Curtis Christenberry, a demonstrator located on sandy soil in the Stewart Community, Hale County, made 48 bushels per acre. He used 600 pounds of 4-10-7 per acre, planted Funk's G-714 on April 26, and side-dressed with 100 pounds ammonium nitrate on May 29.

Corrective Measures for Salinity Problem

(*From page* 22)

range a balanced uptake of positively charged calcium, potassium, and magnesium ions and of negatively charged nitrate, phosphate, and sulphate ions proceeds. At alkaline pH values above this range, plants experience some difficulty in satisfying their negative ion requirements. Our experiments have shown that if seedlings are placed in a culture solution of pH 9.0 there will be no uptake of nitrate or phosphate until the pH of the culture solution is reduced to pH 7.8. The seedlings, of course, accomplish this by evolution of carbonic acid during root respiration.

The chemical and physical alkali-plant relationships are of special interest. Originally the poor growth of crops on alkaline and saline soils was attributed entirely to chemical toxicity. Now it is believed to be largely physical in that an excessive salt concentration in the soil solution makes it very difficult for the plant to obtain sufficient water to meet the transpirational requirement. The osmotic pressure of the soil solution increases with increase in salt concentration. When two salt solutions are separated by an impermeable or semi-permeable membrane, such as the

membrane which separates the soil solution and the solution within the roots, the movement of water will be toward the more concentrated solution. Obviously if the salinity of the soil solution is greater than that of the root sap, the crop will suffer a moisture stress. This is not unlike the inability of humans and animals to satisfy their thirst with sea water.

Irrigation practice contributes greatly to the hazards of the plant-salinity relationship. In irrigated agriculture, the moisture content of the soil, and therefore the concentration of the soil solution, is continuously changing. It is at the point of greatest dilution during or immediately following an irrigation and greatest concentration at the wilting point or the time just preceding an application of irrigation water. Many years ago we recommended that the salt content of the soil should be determined at the soil moisture content represented by the wilting point, for obviously the wilting point is where the salines are most injurious. This is the reason why it is necessary to irrigate more frequently on lands where a salinity problem exists and where a highly saline water is the only water available. In saline soils, crops will exhibit a moisture stress. Even though the moisture content is well above the true wilting point of the soil, this stress is similar to that shown by plants at the true wilting point where there is no salinity. In some cases this salinity may stunt the growth of the crop and yet show none of the outward symptoms such as tip or marginal burn of the leaves. Obviously crop yields may be reduced greatly by salinity and the farmer will be totally unaware of this unless there are adjacent non-saline areas for growth comparison.

Reclamation

In order to reclaim alkaline or saline soils, since saline soils are in danger of becoming alkaline when the excess of salt is leached from them, the same procedure may be followed for both types. They must be leached reasonably free of soluble salts, the soil minerals must be changed chemically by replacing the adsorbed sodium with calcium, and they must be in good structural condition when the reclamation is completed. The latter is of extreme importance and in Arizona we rate soil structure as a major growth-limiting factor, second only to water.

It should be mentioned that unless good drainage is possible and can be accomplished economically, neither a saline nor an alkaline soil can be reclaimed. In the Salt River Valley of Arizona, which is our largest irrigated area, drainage is accomplished by pumping from a water-bearing stratum. If the soil can be drained by tile, drainage canals, pumps, or other means, the next step is to provide some form of soluble calcium unless the soil solution already contains an excess of soluble calcium and the irrigation water to be used contains calcium salts in excess of sodium salts. Practically all the saline and alkaline soils of the Southwest are calcareous but calcium carbonate is not sufficiently soluble for use in rapid reclamation.

Gypsum was the first material used for large scale operations in the reclamation of saline and alkaline soils and for improving the structure of irrigated lands. It has stood the test of time for it has continued to be the most widely used soil corrective through a 75-year period. It is soluble in water to the extent of 600 parts calcium per million parts water and fortunately there are many large natural deposits scattered through the Southwest. The continued popularity of gypsum as a soil corrective is of more than passing interest. Our fundamental knowledge of alkali soil formation and reclamation has changed materially during the last 30 years, yet gypsum fits into the new conception as well as the old. Originally it was believed that gypsum neutralized black alkali. It is now known that this neutralization is only partial and therefore alkali soils cannot be re-

Fig. 5. Showing the effect of reclamation which removes salinity without improving structure. Pot on left shows growth when salinity and structure have both been improved. Two pots on right contain soil in which salt was removed without improvement in structure.

claimed by merely incorporating gypsum in the soil. The soil must be leached after applying the gypsum in order to remove the products of the reaction between sodium carbonate and calcium sulphate and to bring about a replacement of adsorbed sodium.

In some instances nitric and sulphuric acids have been used as alkali soil correctives because they will neutralize excess alkalinity and dissolve the insoluble calcium in the soil.

Sulphur offers the greatest competition to gypsum in the group of alkali soil correctives. It oxidizes readily in the soil to sulphuric acid. This provides for neutralization of excess alkalinity and, due to the reaction between this sulphuric acid and calcium carbonate, it supplies soluble calcium in the form of calcium bicarbonate and calcium sulphate for the replacement of adsorbed sodium. One part sulphur is equivalent to five parts gypsum in reclamation. It acts more slowly than gypsum because it must be oxidized by soil microflora before it is of any value.

Another excellent soil corrective is organic matter. Semi-arid soils are sadly deficient in organic matter, so that animal and green manures not only are good correctives but also benefit the soils in many other ways. By means of the carbonic acid liberated during the breakdown, soluble calcium as calcium bicarbonate is supplied. Secondly, organic matter improves the soil structure, for the decomposition products are excellent binding agents. The ultimate success of any program designed to improve the soil structure depends upon the permanence with which the dispersed clay particles are aggregated into crumbs — that is, water-stable crumbs. Organic decomposition products accomplish this most effectively.

The ideal soil corrective is a mixture of gypsum, sulphur, and manure. The gypsum will supply immediately soluble calcium, the sulphur will serve as a continuing source of soluble calcium, and the manure will tend to bind the soil particles into permanent crumbs.

Control Measures

In the husbandry of alkali soils, an ounce of prevention is truly worth a

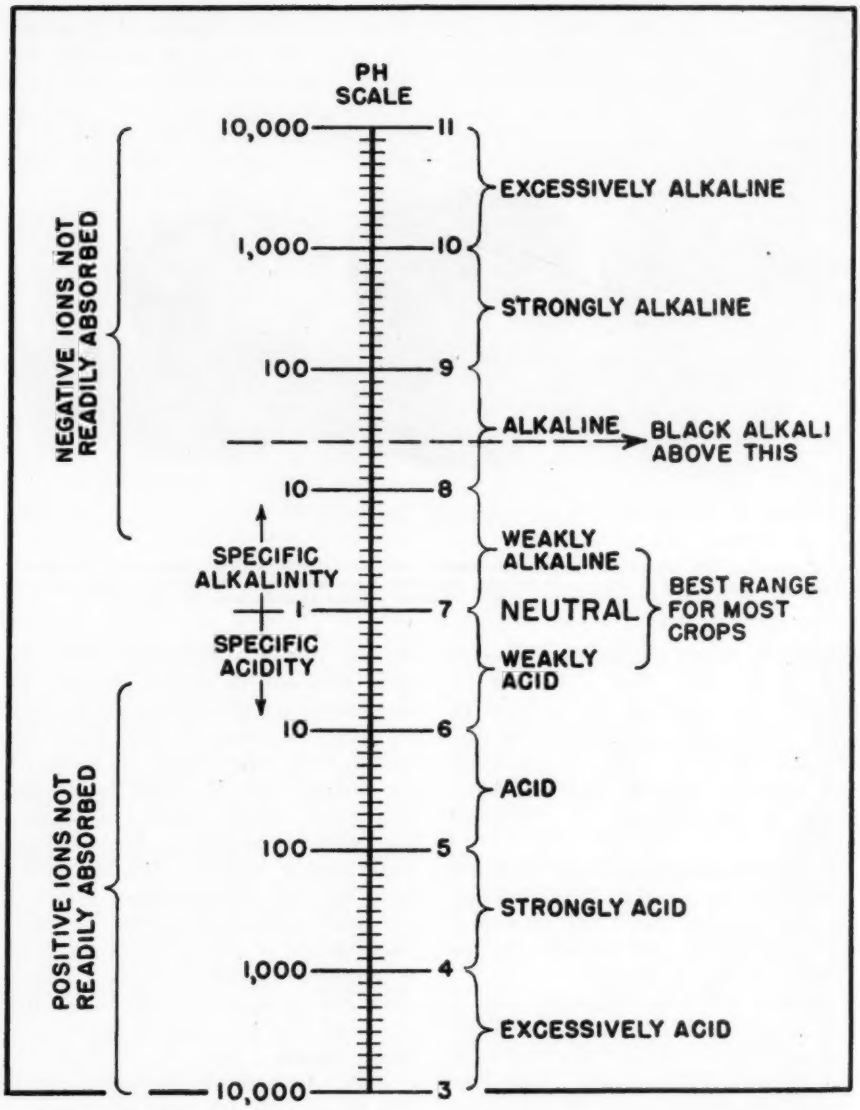

Fig. 6. Relation between pH, alkalinity, acidity, plant growth, specific alkalinity, and specific acidity.

pound of cure. The irrigation farmer in the Southwest will always have the problem of alkalinity and salinity facing him. Obviously the philosophy of prevention is the one to adopt, for control measures are more efficiently and economically operative than reclamation measures.

Of first consideration in control is the quality of the water. Agriculture is probably the only large industry in which hard water is not only desirable but essential. By hard water I mean one in which the calcium salts are in excess of the sodium salts. When a water of this type is not available, the

farmer should resort to applications of gypsum to the irrigation water or make light annual applications of gypsum or sulphur to the soil. This will tend to keep the soil solution well supplied with soluble calcium. This policy is further advisable because a large part of the soluble calcium in irrigation water and the soil solution is precipitated in the soil as calcium carbonate and an appreciable amount used as food by the crop. On the other hand, sodium is not considered as a plant food and practically all that enters the soil remains there in solution. Under the most ideal conditions, therefore, the sodium:calcium ratio in the soil will increase.

Other control measures involve certain phases of the irrigation program; namely, number of irrigations, interval between irrigations, and quantity of water used. Substantially more water must be applied to cropped land than the total lost by evaporation and by transpiration through the crop; otherwise there will be an accumulation of salt in the soil. This may vary from 5 to 30 per cent depending on the soil types and the salinity of the water, and obviously this excess of water should be used to flush the soil and not spread thinly over a series of irrigations.

Soil research has made many valuable contributions toward solving the problems of semi-arid saline and alkaline soils. Our knowledge and understanding of the fundamental chemical and physical reactions between the soluble salts and soil minerals have advanced to the point where reliable advice can be given to farmers. There are wide variations in the soil even on single farms and, therefore, reclamation and control depend to some extent on the ability of the farmer to coordinate the results of research with his own experience.

Fertility is a term used with reference to the supply of plant food in the soil and its availability. When deficiencies exist, commercial fertilizers or other soil amendments may be used to maintain or rebuild it. Productivity is the capacity of the soil to produce. A fertile soil can be non-productive if such growth-limiting factors as salinity, alkalinity, and poor soil structure prevent a crop from utilizing this fertility. Since these growth-limiting factors may often function without any outward evidence of crop distress, it behooves the irrigation farmer to adopt a philosophy of prevention. When a crop shows an outward manifestation of distress, it is then evidence that the time has come for a costly reclamation program.

Motor Meanderings

(*From page* 5)

made on night roads. As I drove along peering past the headlights in snow or rain and listening hard for any signs of engine trouble, my gratitude went to the skill and pains which trained workmen had put into this small single item in a vast assembly line. To be master of a smoothly running mechanism that withstood cold and bad roads and the shocks of indifferent driving, and brought one safely back up the familiar lane toward the cozy lights of home—that was indeed a miracle. We who were not born in the midst of motor marvels and instantly responsive levers have a keener and a deeper appreciation of the wonders that have come to us, but I am afraid that too few of us are good stewards of such rich experiences.

For we now travel at our own will as fast and often faster to distant desti-

nations than many of the overland trains we used to meet with great expectations at the country depot. The road which skirted the rural home where I was raised no longer presents a gently rising, winding hill, lined with locust trees and elderberry bushes. The deep dust of summer no longer fluffs up between the stubby toes of trudging urchins on that somnolent stretch of lane, where one riding in a buggy might hear the bees droning in the clover and spy a robin's nest in a lilac bough, or shout a brief message to a friend standing by a pasture gate.

Our rapidly moving era has no time for that meandering mood. The highway is a straight avenue of blazing concrete in noonday sun, no bushes are on its graded borders, barefoot boys don't dare to take a chance, and the small noises of nature are completely blotted out by the swish and roar and hum of onward motion. But at least you can stop and exchange ideas with more friends in an hour than it was possible for you to visit in the dawdling days of yore. It does have its real and vital compensations, all "poetry and romance" aside.

Take the two eventful trips we took through Canada—the first time by transcontinental train de luxe, with special stop-overs at famous recreation spots, and the next time by leisurely (?) motoring. On that second excursion with the family along, there were many and varied opportunities to get the feel of things, to know the wherewithal and the personalities of towns and people.

WITHOUT a convenient equipage at our private disposal, where would we have known Francois, the genial waiter at the village inn west of Quebec, who gabbled with our daughters and smiled at their high-school French? Could we have halted at the roadside to admire the quaint ovens and the gaudy hooked rugs, examined the thatched roofs and looked at the frequent fences in the realm of ancient "metes and bounds?" Without our own conveyance, excitement over crossing a bumpy, unfinished bridge east of Montreal, and whimsical delight over the ox carts of the Island of Orleans would have never been ours.

AND, moreover, in similar New England rambles by family bus one season later, how could my wife and daughters have had the dear and unforgotten chance to sniffle a little in the cottage where the Alcott sisters lived and wrote the classic so precious to most feminine hearts? How could we have paused at Concord and Lexington along the trail of the Minutemen and storied Paul Revere, with its tradition kept as well burnished and as shining as the silver he created? Without easy egress, would we have gazed upward from the lake along the towering cliff to discern the granite features of the sachem's gloomy face, as introduced to us by Hawthorne? Or could we have watched the Portuguese fishermen wind their nets in that famous harbor from whence so many have "gone down to the sea in ships?"

Could we have learned first hand that New York State is not all pavements and night shows and gluttony and glitter, and that there lie many peaceful meadows, winding streams, and forest reaches in the trek from Elmira to the Hudson?

And then, closer home and dearer still, the possession of a family vehicle of fairly wide range gave us the opportunity to go to accepted and invited places where wild flowers grow, there to take upon permission a few good specimens to transplant in our own rocky nook at home—where some of the hepaticas, violets, and trilliums still bloom for other eyes.

Of course, there have been vandals, interlopers, and trespassers following the wake of the motor age; people who translated their escape from dingy streets and cramped quarters into reckless disregard for privacy and the decent rights of mankind. Others have

made once restful glens and bowers of beauty into a vast litter of despoliation and abandon and robbed the countryside of precious plants. Fortunately, however, they sometimes tackled poison oak and ivy and retribution came home to the right roost.

LOOKING back over the motoring hours of other days, I find that the rides where I had companionship to and fro were nicer ones than the many miles over which I traveled alone. None of my folks were backseat directors, and I was never annoyed in this way by somebody breathing on my neck at every curve. Not even my mother-in-law, believe it or not! They just leaned back and scanned the scenery or gossipped about the relatives we had visited.

I always followed the rule of taking on only riders who were known to me, running no hazards with strangers or pick-ups. How fast the mileage flowed past when I had a congenial co-rider who could argue with me vehemently about all manner of current perplexities. We have solved the problems of cooperation, farm credit, parity prices, production incentives, foreign exports, state and federal relations, and the more intimate ones of mortgages and neighbors and furnaces.

The only drawback to this conversational travel was that we used up so much gas by ourselves and under the hood that we sometimes ran out of both kinds. Then we had to mix walking with talking.

I look back at the isolated travelogues with little real enthusiasm. No doubt I have spent more than an average of 20 hours each week humped over the steering wheel all alone. Meandering is then monotony. In summer the concrete pavement ahead shimmers in the sunlight, you glimpse washing waves of water over the crest in a sort of mirage, the click of the tires and the hum of the motor put you into a drowse, and sometimes in the worst of such fits you just pull up at the shady roadside and take a brief snooze.

Certain roads often traveled day and night finally lose their original charm and local luster. One such numbered highway I followed four times each month for ten years became a burden to me because of traveling it so much alone. I do not care to see it again.

My road work was done for a farm journal. I was not among the fraternity of space-peddlers, who probably had more fretful reveries en route than I did, whose duty was space-filling. It always seemed to me that they supported the paper by their efforts, while maybe I helped to make it saleable in the first place. Ordinarily they dictated the total amount of pages each issue carried, more or less, while I simply laid by a good collection of personality and production yarns to fit any linage which remained.

Being a little on the shy side, I did not possess the daring and ego that is such a mainstay of urban reporters. I hated to intrude on strange farmers, uncorking personal questions and maybe taking a few pot shots at them with a graflex. I have drifted around a whole section of land sometimes working up the right line of approach. Yet usually after the ordeal was over and my notes and films were safely stowed away, I drove out of the farmstead with the back seat full of fruit or vegetables or eggs or other plunder —almost like your traditional country parson taking his toll in kind.

THEREUPON my day-dreaming while driving began. Often it would revolve around the mental picture of just how this "story" should be presented, what slant was the best for a "lead," how certain titles and legends would look, and the effect of the feature on the general situation.

My travels were generally of two kinds—attending formal gatherings and

conventions, which usually meant a direct route with no pauses; and cruising, like a taxi, searching the countryside for nice buildings, new mechanical methods in use, or likely looking livestock or chickens. This cruising seems now like an aimless sort of excuse for making a living. It sounds like a tramp's life. Maybe it was, for too few of the articles resulting from those rambles have ever been preserved—unless in private scrapbooks I know not of.

In a personal sense, I never had the dog sent after me. However, owing to some adverse political slants which appeared in some of the columns of our sheet unrelated to my field hegiras, a farmer on one occasion refused to let me alight in his barnyard on my harmless and utterly non-partisan mission. "No dumb writer for that gol-blasted paper is goin' to give me a write-up," was his diplomatic comment.

THIS turn of the tide and sundry objections to our support of support prices and our boosting of benefit payments sometimes delayed my contacts and disrupted the free flow of my pristine style. As long as I stuck religiously to the accepted standards of rural journalese jargon and played up rugged individualism, prideful progress in production this year over that, good bulls and helpful families, overcoming weather and bugs, outguessing the neighbors, and kindred safe-and-sane features—well, my old car was welcome to free gas at the farmer's own tank and a blessing in farewell.

So after many moons of this meandering and lonely riding one comes to the conclusion that at least the work was clean, that the time might have been more wasted otherwise, and that a lame back and a stiff left foot are mementos soon forgotten from tedious travels. In these peregrinations I may not always have toted home the bacon, but I am satisfied because I never sold anyone a gold brick.

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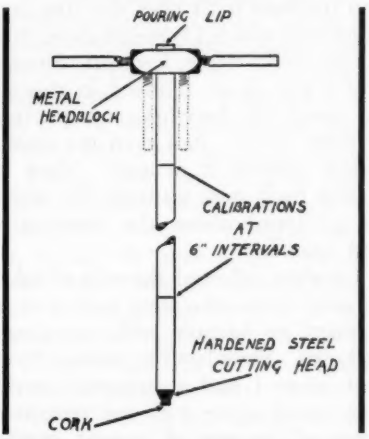

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The instrument is sturdily built of non-corrodible metals, light in weight (3½ lbs.), and calibrated in 6" intervals for accurate soil sampling to any depth to 3 ft. It is so designed that the entering soil core passes freely into the upper tube and upon inversion is discharged without "sticking." Price each $15.00 f.o.b. Towson, Md. Plastic Vials (1¼" x 5⅞") for containing soil samples may also be had at $1.80 per dozen.

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AS A CHEMIST SEES HER

Analysis of the creature known as woman as seen through the eyes of the chemist:

Symbol: Wo

Accepted Atomic Weight: 120.

Physical Properties: Boils at nothing and freezes at any minute. Melts when properly treated. Very bitter if not well used.

Occurrence: Found wherever man exists.

Chemical Properties: Possesses great affinity for gold, silver, platinum, and precious stones. Violent reaction if left alone. Able to absorb great amount of food matter. Turns green when placed beside a better looking specimen.

Uses: Highly ornamental, useful as a tonic in acceleration of low spirits and an equalizer in the distribution of wealth. Is probably the most effective income-reducing agent known.

CAUTION: Highly explosive in inexperienced hands.

—E. J. Kraska.

Very often it is the mink in the closet that keeps the wolf at the door.

BIG MOMENT

The lowly cub reporter who was assigned to cover the class plays of the high school came in for his share of literary fame when the following appeared in his write-up: "The auditorium was filled with expectant mothers, eagerly awaiting the appearance of their offspring."

Penny (nine years old)—"Mother, that horrid Jones boy called me a tomboy."

Mother (noting her torn dress and tear-streaked face, and remembering the Jones boy was twice her size)—"And what did you do?"

Little Giri—"I made him take it back. I kicked him in the shins and tripped him and sat on his chest and pounded his head against the ground until he yelled: 'You're a perfect lady!' "

STOPPED COLD

A Des Moines home-owner, wearing his oldest clothes, was mowing his lawn when a woman in a ritzy car stopped and asked him: "What do you get for mowing lawns?"

"The lady who lives here lets me live with her," replied the home-owner, and the lady in the car, without comment, drove away.

An Ex-GI who was plenty "pitched off" from being ordered around in the Army was filling out an income-tax blank; he came to the part marked "Do not write in this space." Incensed at this limitation on his personal liberty, he penciled in the forbidden space:

"I will write where I damn please."

"Am dat you, Liza?"

"Yessuh."

"Am you' gwine to marry me?"

"Sho ah is—who is dis talkin'?"

Need for—

BORON IN AGRICULTURE

Authorities have recognized that the depletion of Boron in soil has been reflected in limited production and poor quality of numerous field and fruit crops.

Outstanding results have been obtained with the application of Borax in specific quantities or as part of the regular fertilizer mix, improving the quality and increasing the production of alfalfa and other legumes, table beets, sugar beets, apples, etc.

The work of the State Agricultural Stations and recommendations of the County Agents are steadily increasing the recognition of the need for Boron in agriculture. We are prepared to render every practical assistance.

Borax is economical and very little is required. It is conveniently packed in 100 lb. sacks and stocks are available for prompt delivery everywhere in the United States and Canada. Address your inquiries to the nearest office.

PACIFIC COAST BORAX COMPANY

NEW YORK CHICAGO LOS ANGELES

BORAX

for agriculture

20 Mule Team. Reg. U. S. Pat. Off.

Make your own GOOD LUCK!

Would you like to know the secret of catching a nice "mess" of big fish every time you "wet a hook" in your favorite pond?

The secret is *plankton algae!* All the fish in your pond depend, directly or indirectly, on plankton algae for food. They either eat plankton algae, or eat animal and insect life which exists on plankton algae, or eat other fish which eat plankton algae.

Plankton algae is a tiny water plant, so small it cannot be seen by the naked eye. But you can tell when plankton algae is present in sufficient quantities, as it gives the water a greenish or brownish color.

When your pond is well-managed and properly stocked with fish and the water supports an abundant growth of plankton algae, you always have good fishing luck. Like other plants, plankton algae requires plantfood for abundant growth. By adding fertilizer to your fish pond, you increase the growth of plankton algae and thus supply the food needed to grow more fish and bigger fish.

Virginia - Carolina Chemical Corporation has been a leader in the manufacture of better fish-pond fertilizers for many years. In growing crops or growing fish, make your own good luck: *Use* V-C *Fertilizers!*

FREE: *Write to the address below for your free copy of* "Good Luck for Fishermen."

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Richmond, Va. • Norfolk, Va. • Greensboro, N. C. • Wilmington, N. C. Columbia, S. C. • Atlanta, Ga. • Savannah, Ga. • Montgomery, Ala. Birmingham, Ala. • Jackson, Miss. • Memphis, Tenn. • Shreveport, La. Orlando, Fla. • E. St. Louis, Ill. • Baltimore, Md. • Carteret, N. J. • Cincinnati, O.

VC FERTILIZERS

Make the good earth better!

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NEW CHEMICALS
TO OVERCOME
FUNGI-INSECTS-WEEDS

☑ *Check the pest you want to Control!*

SEED DECAY AND DAMPING-OFF OF PEAS, BEANS, LIMA BEANS AND CORN—Use Spergon seed protectant. It makes reduced planting rate possible with stronger stands, higher yields.

DOWNY MILDEW OF CABBAGE—Use Spergon (Wettable) as a spray or dust. It is widely recommended by leading authorities.

LEAF BLIGHTS AND ANTHRACNOSE OF TOMATOES—Use Phygon (Wettable) as a dust or spray. It gives economical control and increased yields.

SEED DECAY AND DAMPING-OFF OF BEETS, SPINACH, TOMATOES, PEPPERS AND SWISS CHARD—Use Phygon seed protectant. It is outstanding for these crops.

ANTHRACNOSE OF BEANS CAN BE CONTROLLED—Use Phygon as a seed protectant, followed by Phygon (Wettable) as a spray ten days after emergence. Don't lose your bean crop this year now that an effective control is available.

CORN BORER AND THRIPS—Use Syndeet-S-30. This is an oil solution containing 30% DDT for making emulsion type sprays. It has given effective economical control in field applications.

APHIDS, EUROPEAN RED MITES AND CODLING MOTH—Use Syndeet-30. At economical dosages, it gives commercial control of these orchard pests.

APHIDS, COLORADO POTATO BEETLES, LEAF HOPPERS AND FLEA BEETLES ON POTATOES—Use Syndeet-30. It gives control with a labor-saving reduction in the number of sprays required. Syndeet-30 is compatible with Bordeaux mixture.

WEED CONTROL—Use Tufor-40, Tufor-70 and Tufor-E. These formulations of 2, 4-D meet selective weed control problems.

EDIBLE VEGETABLE INSECT CONTROL—Use Syntone—a fortified rotenone emulsion.

These recommendations are made on the basis of authoritative field trials by leading plant pathologists and entomologists.

Write for technical data sheets covering your specific problems.

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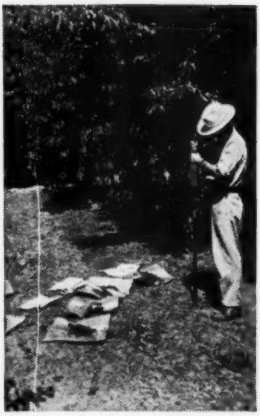
THE PLANT SPEAKS

A new four-reel series of 16 mm., sound, color films which may be booked independently or in any combination. They may be used to best advantage when shown at least one day apart and in the following sequence:



THE PLANT SPEAKS THRU DEFICIENCY SYMPTOMS pictures soil depletion, erosion, and deficiency symptoms on plants. (Running time 25 min. on 800-ft. reel.)

THE PLANT SPEAKS, SOIL TESTS TELL US WHY depicts taking soil samples on the farm and the interpretation of soil tests. (Running time 10 min. on 400-ft. reel.)

THE PLANT SPEAKS THRU TISSUE TESTS shows the value of tissue testing and the procedure for testing plant tissues in the field. (Running time 14 min. on 400-ft. reel.)

THE PLANT SPEAKS THRU LEAF ANALYSIS evaluates leaves in plant growth and leaf analysis in determining fertilizer needs. (Running time 18 min. on 800-ft. reel.)

We shall be pleased to loan these films to agricultural colleges, experiment stations, county agents, vocational teachers, responsible farm organizations, and members of the fertilizer trade.

OTHER 16MM. COLOR FILMS AVAILABLE FOR TERRITORIES INDICATED

Potash in Southern Agriculture (South)
In the Clover (Northeast)
Bringing Citrus Quality to Market (West)
Machine Placement of Fertilizer (West)
Ladino Clover Pastures (West)
Potash from Soil to Plant (West)
Potash Deficiency in Grapes and Prunes (West)
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Potash Production in America (All)
Save That Soil (All)
Borax From Desert to Farm (All)

IMPORTANT

Requests should be made *well in advance* and should include information as to group before which the film is to be shown, date of exhibition (alternative dates if possible), and period of time of loan.

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